NOAA Regional Public Private Partnership Analysis and Recommended Strategy

by

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A master project in

School of Natural Resources and Environment

University of Michigan

April 2017

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Client: National Oceanic and Atmospheric Administration Great Lakes Regional Collaboration Team

ABSTRACT

In this project, our project team is working with the National Oceanic and Atmospheric Administration (NOAA) Regional Collaboration team to identify potential public-private partnership opportunities in the Great Lakes region. The end goal of this project is to provide NOAA with deliverables that include a recommendation list of partner organizations in the Great Lakes and a methodology rubric that specifies the criteria we used to determine the recommended organizations. Through this project, we hope to help inform NOAA decision-makers on future collaborations that support the impactful and efficient use of federal funds in Great Lakes region, and ensure that federal investments are cost effective and NOAA is meeting end user needs through provisions of its data, products, and services.

In order to generate a recommendation list of partner organizations to submit to NOAA, we used a variety of research methods in this project. Methods include literature review, interviews and criteria evaluation. From our research, we were able to learn important information, such as NOAA's current capabilities and partnership needs in the Great Lakes region, as well as key components of public-private partnerships that have been successful in the past. We also identified the key environmental issues and potential collaboration topics in which future NOAA partnerships would be most beneficial. These potential collaboration topics include **invasive species, harmful algal blooms, green infrastructure, customized weather service, coastal navigation, coastal management, habitat conservation and economic development in the Great Lakes region**. Based on these issues and topics, we found many potential partners. We divided these partners into 6 categories, which are **industries, foundations, coastal management, education, restoration, and conservation**. For each category, we defined a specialized methodology criterion to help evaluate partners. Using our specialized methodology criteria, we evaluated the partners on our list for each category and generated an overall score for each organization.

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I. INTRODUCTION

Purpose and need

The National Oceanic and Atmospheric Administration (NOAA) is looking to strengthen and leverage public-private partnerships to provide the nation with the best available science and high quality environmental information. In the Great Lakes region, the NOAA regional collaboration team is interested in exploring innovative and non-traditional public-private partnership opportunities that are strategically aligned with NOAA's current priorities and mission critical work.

Goals of the Project

- Produce methodology criteria rubric that is used for evaluating potential partners in this project and can be used for reference in the future
- Generate recommendation list of organizations that we recommend NOAA consider partnering with in the future

II. METHODS

Literature review

To better inform our selection of partner organizations that fit well with NOAA's objectives, we divided our literature review in a way to answer two main questions.

Question 1: What are the most important environmental issues and collaboration topics that NOAA should focus on with the help of partners in Great Lakes region?

Question 2: What are the most vital components of effective public-private partnerships in the past projects?

Based on these two questions, we conducted a literature review that used sources from research articles, online journals, books, news articles, and websites. When looking at online research articles and journals, our primary search option was using the search capabilities of the University of Michigan Library. For news articles, we used news from GLERL and other NOAA-related groups, as well as websites such as BBC and National Geographic.

Interviews

We conducted interviews with School of Natural Resources and Environment (SNRE) faculty, NOAA staff, and environmental professionals to increase our understanding of the most prominent Great Lakes environmental issues and to understand NOAA's current capabilities and partnership needs.

In our interviews with SNRE faculty, much of our focus was in gaining a overview of the field the faculty worked in, and to understand the environmental issues that related to NOAA and our project.

During our interviews with NOAA staff, we focused on understanding what NOAA's current capabilities are, and what NOAA needs in any future partnership arrangement. The individuals we interviewed worked in one of our main environmental topic areas, and they helped give us a lot of information on NOAA-specific activities in those areas, as well as what capacity gaps partnerships would ideally fill.

Individuals that we interviewed or talked to include:

Tashya Allen (NOAA, Coastal Hazards Specialist)
Dave Bergeron (Minnesota Sea Grant College Program, Maritime Transportation Specialist)
Ellen Brody (NOAA, Great Lakes Regional Coordinator)
Allen Burton (SNRE, Professor)
Bilal Butt (SNRE, Professor)
Bradley Cardinale (CILER, Director)
Jennifer Day (NOAA, Regional Coordinator)
James Diana (SNRE, Director of Michigan Sea Grant College Program)
Rachael Franks-Taylor (NOAA, Coastal Management Specialist)
Bob Grese (SNRE, Professor)
Terry Heatlie (NOAA, Habitat Restoration Specialist)
Sonia Joshi (NOAA, Communications and Outreach Specialist - HABs)
Doug Kluck (NOAA, Central Region Climate Services Director)
Deborah Lee (NOAA, Great Lakes Regional Team Lead)
Liz Mountz (NOAA, Coastal Management Specialist)
Kelli Paige (GLOS, Executive Director)
Catherine Riseng (SNRE, Research Scientist)
Ed Rutherford (NOAA, Research Fishery Biologist)
Heather Stirratt (NOAA, Great Lakes Regional Lead)
Rochelle Sturtevant (NOAA, Regional Sea Grant Specialist - Outreach)

Methodology rubric

Our methodology rubric is a form that allows us to efficiently gauge a potential partner organization's performance. Based on the major environmental issues in Great Lakes region and NOAA's capabilities, we defined collaboration topics including invasive species, harmful algal blooms, green infrastructure, customized weather service, coastal management, coastal navigation, habitat restoration and boosting the economic development in Great Lakes region. For each of these topics, we considered whether potential partner organizations would fill the role of information producer, information distributor, information end-user, or some combination.

We divided potential partners into 6 categories which are industries, foundations, coastal management, education, restoration, and conservation. We created separate criteria for the evaluation of partners at each category. In other words, organizations grouped in coastal management would be evaluated using one set of criteria, while organizations grouped in industries would be evaluated using a different set of criteria.

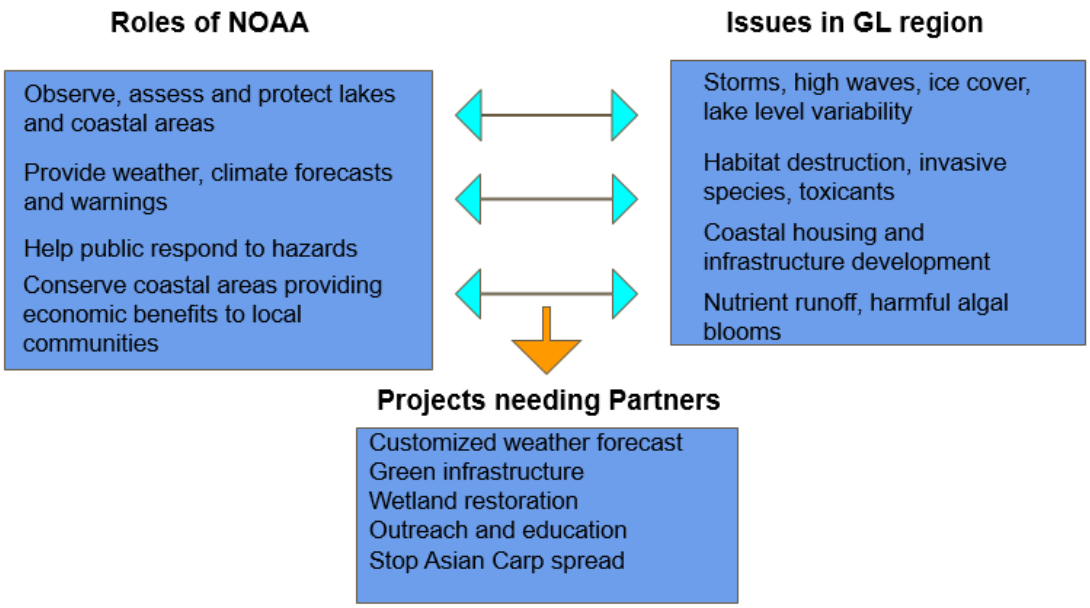
We defined a set of criteria which would quantitatively and qualitatively evaluate potential partner organizations that we felt would be a good fit with NOAA's current partnership needs in Great Lakes region. The separate criteria items within each partner category were each assigned a different weight. Some criteria items have greater weight, such as 20% of the total, while other criteria items may only have 5% or 10% weight. We based the weights of the criteria items on how important we felt a specific criteria item was to ensuring an effective partnership between NOAA and the prospective partner organization within a topic. The importance we placed on each criteria item stemmed from our previous research, case studies, and interviews.

Evaluations

Using our methodology rubric and the criteria items, we evaluated prospective partner organizations on our list. We graded the individual criteria items based on the weight. For example, when looking at the outreach capabilities of an organization that is assigned a 15% weight, we would look at whether the organization has a low level, a sufficient level, a high level, or a excellent level of outreach capability, and assign it a score from 0-15. We then repeated this process with each criteria item for each organization. Afterwards, we added up all the scores to give a cumulative score for the organization, with a maximum score of 100.

Summary: The below flowchart (Figure 1) is a visual representation of our methodology, from the beginning to the end of the master project. We started by defining the roles of NOAA in Great Lakes region, and cross-referencing NOAA's roles with the most prominent environmental issues in the Great Lakes region. From there, we selected specific topics in which NOAA could utilize partners' expertise to help with the environmental issues identified in the previous step.

After we selected these interesting topics, we thought of potential cooperation projects with organizations in hotspot areas. Once here, we identified specific partners, which ultimately led to an evaluation and creation of a recommended partners list.



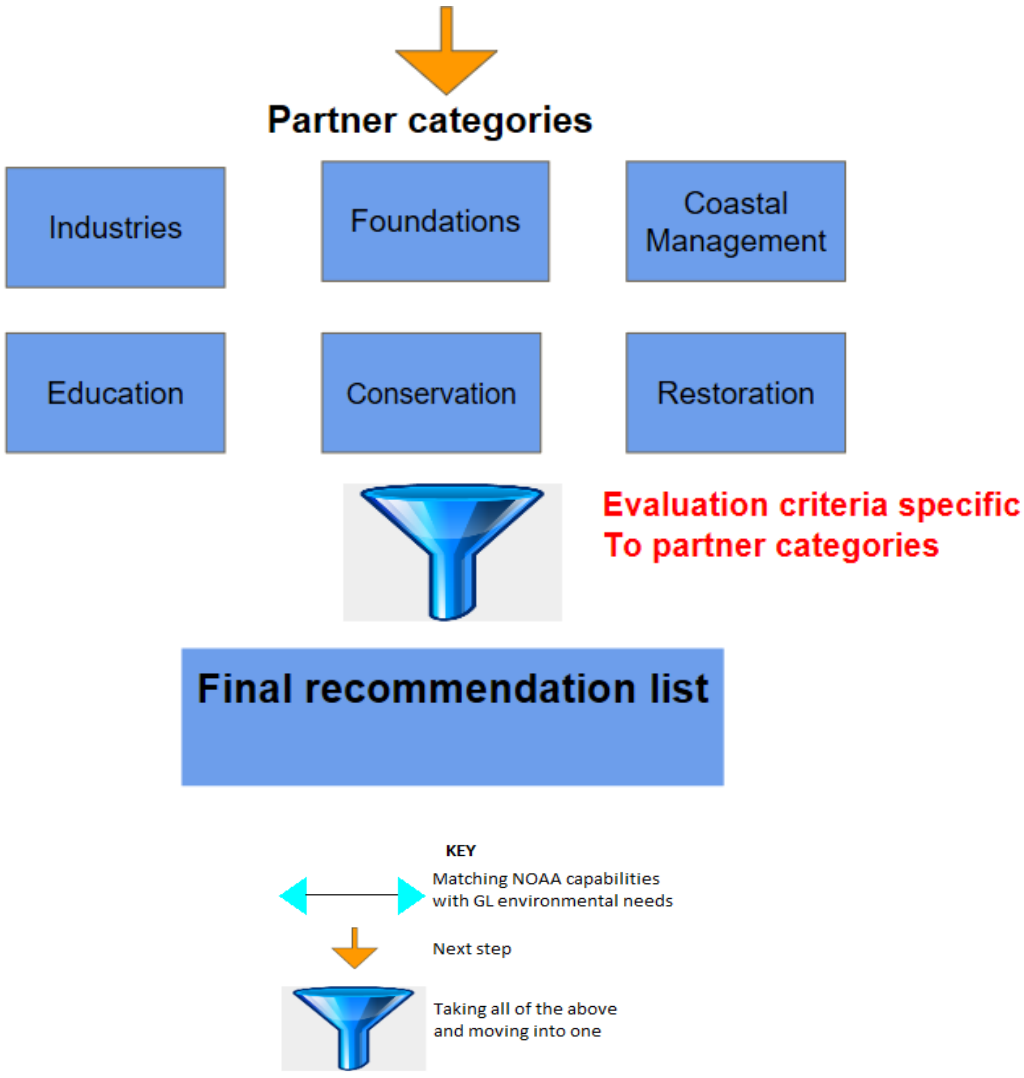


Figure 1: Methodology flowchart

III. KEY FINDINGS

NOAA's capabilities

Using our interviews and NOAA resources, we learned that NOAA's main capabilities include collaboration experience and granting authority, outreach and extension, information deliverables, and connections on the local, state, and national levels.

Collaboration Experience: NOAA has a long history of working with both public and private organizations in order to solve problems and fulfill a public need.

Granting Authority: NOAA has the ability to provide funding for specific projects that advance its mission and goals in the Great Lakes region. Funding can be provided to both large- and small-scale projects, with scope ranging from regional to local.

Outreach and Extension: NOAA has various resources available to promote environmental literacy and increased awareness of NOAA's work and goals in the Great Lakes region. Extension programs are available to help make science-based solutions understandable and usable to people in the Great Lakes, businesses, and communities.

Information Deliverables: NOAA has an extensive database of oceanic and atmospheric - based information. Information on phenomenon such as weather forecasts, ocean currents, and harmful algal bloom predictions can help local communities mitigate harmful impacts and make more efficient use of funds.

Connections: NOAA has wide-ranging relationships with organizations and individuals on local, state, and national levels for a variety of topics.

NOAA's needs

For NOAA's future partnership considerations, our research and interviews suggested that NOAA would be best served to look for organizations that can help NOAA develop synergies, increase public outreach and service, facilitate economic development and show results, support underserved and underrepresented populations, foster innovative ideas, get new scientific data, and create products that can be used for multiple purposes.

Great Lakes: Major Environmental Issues

Invasive Species

Invasive species are considered to be one of the greatest threats to marine and coastal biodiversity world-wide, second only to habitat loss.[1] Invasive species can harm both the natural resources in an ecosystem as well as threaten human use of these resources. An invasive species can be introduced to a new area via the ballast water of oceangoing ships, intentional and accidental releases of aquaculture species, aquarium specimens or bait, and other means. Invasive species are capable of causing extinctions of native plants and animals, reducing biodiversity, competing with native organisms for limited resources, and altering habitats. This can result in huge economic impacts and fundamental disruptions of coastal and Great Lakes ecosystems.[2]

The coastal areas of the United States possess some of the world's most diverse and fragile ecosystems and support numerous species that depend on these habitats for survival. Unfortunately, human development has rendered these once pristine areas vulnerable to the

[1] NOAA Habitat Conservation. "Invasive Species". NOAA Fisheries Office of Habitat Conservation. <http://www.habitat.noaa.gov/restoration/programs/invasivespecies.html>.
[2] National Ocean Service. "What is an invasive species?" NOAA. <http://oceanservice.noaa.gov/facts/invasive.html>.

introduction of opportunistic invasive species. NOAA has recognized the profound effect that invasive species have on aquatic ecosystems, and has resources available to help protect coasts from invasive species.

Aquatic nonindigenous species (ANS) are one of the greatest stressors facing the Great Lakes aquatic ecosystem. ANS can alter energy pathways, lower food web and fisheries productivity, and cost millions of dollars annually in control and mitigation. NOAA's Great Lakes Aquatic Nonindigenous Species Information System (GLANSIS) is a searchable database with fact sheets, threat assessments, and maps designed to improve stakeholder education, and inform prevention, management, and control of ANS.

In partnerships, GLANSIS has the potential to better inform managers of current and future threats from ANS.[3] Potential partner organizations for NOAA may include information co-producers to help collect data on invasive species, and information end-users that can use data from NOAA to help detect invasive, limit the spread of invasive, and other practical activities.

Harmful Algal Blooms

Harmful algal blooms, or HABs, occur when colonies of algae—simple plants that live in the sea and freshwater—grow out of control while producing toxic or harmful effects on people, fish, shellfish, marine mammals, and birds. The human illnesses caused by HABs, though rare, can be debilitating or even fatal. HABs have been reported in every U.S. coastal state, and their occurrence may be on the rise. HABs are a national concern because they affect not only the health of people and marine ecosystems, but also the 'health' of local and regional economies. At present, HABs cause about $82 million in economic losses to the seafood, restaurant, and tourism industries each year. HABs reduce tourism, close beaches and shellfish beds, and decrease the catch from both recreational and commercial fisheries.[4]

There are many factors that may contribute to HABs. In some cases, HABs may be linked to an

[3] Cooperative Institute for Limnology and Ecosystems Research. "GLANSIS: Science and Management Support - Overview and Objectives." <https://ciler.snre.umich.edu/project/glansis-science-and-management-support/>.
[4] National Ocean Service. "Harmful Algal Blooms: Tiny Plants with a Toxic Punch". National Oceanic and Atmospheric Administration. <http://oceanservice.noaa.gov/hazards/hab/>.

overflow of nutrients (mainly phosphorus, nitrogen and carbon) from sources like farmland to lakes and seas. This overflow builds up at a rate that stimulates and increases growth of the algae in the environment. HABs may be linked to other factors as well, such as wind and water currents favorable to algal species, sluggish water circulation, unusually high water temperatures, and extreme weather events such as hurricanes, floods, and drought.[5]

NOAA's Great Lakes Harmful Algal Blooms and Hypoxia program is a collaborative effort with CILER to increase understanding of and predict HABs and hypoxia. Methods include using satellite images, remote sensing, buoys, a monitoring program in Lake Erie, Saginaw Bay, and Lake Huron, and advanced genetic techniques to understand the seasonal dynamics of HABs and hypoxic events. Data collected is used to inform predictive models that are used by stakeholder groups such as drinking water managers.[6]

In terms of partnerships, the most useful ones relating to HABs will be collaborations that can assist NOAA in areas such as nutrient run-off monitoring, wetland restoration, and predictive models. Therefore, information co-producers that can help NOAA collect data on HABs and information distributors that can help NOAA distribute information to groups such as waters managers would likely be the most useful types of partners.

Green Infrastructure

Stormwater runoff is a major cause of water pollution in urban areas. When rain falls on our roofs, streets, and parking lots in cities and their suburbs, the water cannot soak into the ground as it should. Stormwater drains through gutters, storm sewers, and other engineered collection systems and is discharged into nearby water bodies. The stormwater runoff carries trash, bacteria, heavy metals, and other pollutants from the urban landscape. Higher flows resulting from heavy rains also can cause erosion and flooding in urban streams, damaging habitat, property, and infrastructure.[7]

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[5] National Ocean Service: Harmful Algal Blooms

[6] GLERL. "Great Lakes HABs and Hypoxia." <https://www.glerl.noaa.gov//res/HABs_and_Hypoxia/>.

[7] Environmental Protection Agency. (2016). "What is Green Infrastructure? "<https://www.epa.gov/green-

Green infrastructure is a network of decentralized stormwater management practices, such as green roofs, trees, rain gardens and permeable pavement, that can capture and infiltrate train where it falls, reducing stormwater runoff and improving the health of surrounding waterways. Green infrastructure has benefits such as reducing polluted stormwater runoff, positively impacting energy consumption and other elements of community health, and providing flexibility to communities to adapt infrastructure to climate change.[8]

When rain falls in natural, undeveloped areas, the water is absorbed and filtered by soil and plants. Stormwater runoff is cleaner and less of a problem. Green infrastructure uses vegetation, soils, and other elements and practices to restore some of the natural processes required to manage water and create healthier urban environments. At the city or county scale, green infrastructure is a patchwork of natural areas that provides habitat, flood protection, cleaner air, and cleaner water. At the neighborhood or site scale, stormwater management systems that mimic nature soak up and store water.[9]

NOAA's information resources and extreme weather forecasts has the potential to help urban areas design green infrastructure more effectively. Green infrastructure partnerships should target those urban areas with pervasive flooding and that have the local infrastructure in place to support development of green infrastructure. Potential partner organizations may include information distributors such as landscape designing companies or end-users like vulnerable communities.

Customized Weather Service

The National Weather Service (NWS) is the component of NOAA that provides weather, water, and climate data. NWS also provides forecasts and warnings about extreme weather events. The area in which NOAA could use partnerships is in providing more detailed weather

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infrastructure/what-green-infrastructure>.

[8] Center for Neighborhood Technology. (2010). "The Value of Green Infrastructure - A Guide to Recognizing Its Economic, Environmental and Social Benefits." <http://www.cnt.org/sites/default/files/publications/CNT_Value-of-Green-Infrastructure.pdf>.

[9] Environmental Protection Agency, 2016

information to a particular group of people, and make it easier and more convenient for citizens to access the information. Ideal partners for NOAA include information distributors such as media companies and tech companies that produce accessible and easy-to-use things such as phone apps. End-users can also be good partners for NOAA.

Coastal Management

For NOAA, coastal management refers to actions taken to keep residents safe, the economy sound, and natural resources functioning. This is currently accomplished with federal and state partnership programs. Federal legislation provides overarching mandates, while federally approved state programs provide the day-to-day implementation.[10] NOAA's Office for Coastal Management oversees the implementation and provides technical assistance.

Digital Coast is a NOAA-sponsored website focused on helping communities address coastal issues and has become one of the most-used resources in the coastal management community. Digital coast provides coastal data and the tools, training, and information needed to effectively use the data. The data sets range from economic data to satellite imagery, and the website contains tools that make the data easier to find and use.[11] Previous examples of Digital Coast projects include helping coastal New Jersey improve its resiliency planning and aiding in the development of a flood risk tool to speed up the process for residents, business owners, and government officials estimating the risks.

In coastal management, NOAA's main goals are to mitigate the impact of development on coastal ecosystems and ensure the sustainable management of natural resources. To aid in these goals, NOAA can leverage resources such as Digital Coast. In addition, NOAA can look for businesses with coastal landholdings that could demonstrate best practices, in order to lead by example and recruit others to be good stewards of Great Lakes shorelines.

Coastal Navigation

NOAA's Coast Survey creates and maintains the Great Lakes nautical charts. People who use

[10] Office for Coastal Management. "Protecting Coastal Communities". National Oceanic and Atmospheric Administration. <https://coast.noaa.gov/>.
[11] Office for Coastal Management

nautical charts include commercial mariners, recreational boaters, coastal managers, city planners, scientists, environmentalists, and developers. Besides safe navigation, some other uses for nautical charts include showing the limits of international boundaries and fishing limits, offshore mineral development and oil exploration, places for mooring buoys and safe anchorage sites, places to deposit spoils, planning building projects that extend into the water (such as piers and marinas), and supporting conservation efforts by determining the limits of underwater preserves such as national marine sanctuaries, national estuarine research reserves, and marine protected areas.[12] The Office of Coast Survey has staff members attend national and regional boat shows to connect more with local users, which is a good way to ask questions about safe and efficient marine commerce.

NOAA's partnership needs in this area include increasing small-scale mapping ability along coasts, a way of redistributing vessels internally from areas with surplus to areas with deficits, and information co-producer mapping initiatives such as citizen science.

Habitat Conservation/Restoration

The NOAA Restoration Center works throughout the US to restore coastal habitats. The goal of habitat restoration is to rebuild functioning and natural ecosystems that work as they did before they were polluted or destroyed. Techniques can include active restoration, such as removing fish passage barriers and re-vegetating riparian and wetland areas, and passive restoration, such as minimizing vehicle access to estuaries and beaches and purchasing conservation easements.

Some of NOAA's targeted efforts include work protecting and restoring fish habitat such as wetlands and coral reefs, opening streams and rivers for fish passage, planning for climate adaptation, and collaborating with partners and federal agencies on regional ecosystem conservation.[13]

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[12] National Ocean Service. (2009). "Diving Deeper: Episode 5 - What is a Nautical Chart?" NOAA. <http://oceanservice.noaa.gov/podcast/mar09/dd032309transcript.html>.

[13] NOAA Habitat Conservation. "Our Work". NOAA. <http://www.habitat.noaa.gov/ourwork/index.html>.

IV. Partner Selection

Roles of Partners

1) Information producer

Information producer partners like universities, research institutions and government agencies work with NOAA to produce scientific knowledge to increase the understanding and responses to environmental impacts in Great Lakes region.

Attributes for an information producer partner:

- Partner is willing to work with NOAA to produce scientific knowledge, improving environment quality and benefitting the people living in in Great Lakes region;
- Partner has strong scientific infrastructure in place to gather information and conduct new research in a specific field which NOAA is interested in;
- Partner has complementary strengths to NOAA, and has the capacity to share resources;
- Partnership provides access to expertise, facilities and technology NOAA does not have;
- Prospective outputs and activities could not be achieved or could be achieved but with more time and resource in the absence of the partnership;
- Partner's previous collaboration projects show it is good at finding ways to communicate comfortably with partner;
- The key staff is ready to push forward the cooperation in partner's organization;
- The partner has good academic reputation;
- The potential collaboration project should focus on Great Lakes region;
- The potential collaboration project should have clear and measurable goal;
- The partnership would benefit all organizations (both sides) in their respective missions;
- Partner has established relationships that will help provide science knowledge for NOAA

2) Information distributor

Information distributor partners can help NOAA distribute its scientific information, research results and service in Great Lakes region.

Attributes for an information distributor partner:

- Partner organization has broad connections to communities of influence and communities NOAA is trying to reach through its services;
- Partnership would allow NOAA to reach new audiences;
- No minimum audience number requirement for a distributor, but more is better;
- Partner is reputable and respected in its specific field;
- Partner's mission should focus on distributing information and knowledge to audiences, not just for business interests;
- Proficiency in distributing information to the general public;
- A clear understanding between NOAA and the partner of the roles for each organization;
- Constant communication with specific points of contact for each partner, who are committed to sustaining the partnership and facilitating opportunistic collaborations to capitalize on capabilities;
- NOAA avoids duplication, and does not compete with a service that is currently or can be provided by the partner;
- The potential collaboration project should focus on Great Lakes region;
- The potential collaboration project should have clear and measurable goal;
- The key staff is ready to push forward the cooperation in partner's organization;

3) Information End-User

Information end-user partners include communities, companies or organizations who have a local and real incentive to seek information assistance from NOAA (developmental pressure, poor environmental conditions, limitations to grant funding,etc.)

Attributes for an information end-user partner:

- Supportive legal and institutional environments (e.g. legislation giving authority to enter into partnership agreements);
- Willingness of the potential partners to work together in providing environmental services (help larger scale projects become economically possible);
- Equitable allocation of risk (better distributing allocation of risk between NOAA and end-users)
- No reputational risk for NOAA;
- No historical greenwash record for the partner;
- Not only economic benefits, but also environmental and social benefits can be achieved;
- Partnership allows NOAA to capitalize on interest in local issues directly connected to agency mission and goals;
- The potential collaboration project should focus on Great Lakes region;
- The potential collaboration project should have clear and measurable goal;
- The key staff is ready to push forward the cooperation in partner's organization;
- Ability to leverage local and/or regional funding and resources, such as volunteers;
- Existence of established personal/professional relationships between key individuals knowledgeable about local issues and the leveraging of resources.

Categories of Partners

We identified a preliminary list of partner organizations, using our general methodology as a resource and ensuring the partner fits in one of the seven major environmental issues and topics. The preliminary list of partners includes the following:

Industries:

Council of Great Lakes Industries
United States Business Council for Sustainable Development
Great Lakes Captains Association
Great Lakes Boating Federation

Foundations:

Fred A. and Barbara M. Erb Family Foundation

Frey Foundation

The Brico Fund

Fund for Lake Michigan

Coastal Management:

Center for Neighborhood Technology

Michigan Water Environment Association

Milwaukee Metropolitan Sewerage District

Great Lakes Beach Association

Great Lakes Surf Rescue Project

Education:

Michigan Association of Nonpublic Schools

Michigan Association of School Boards

Project Grow

Great Lakes Aquarium

Restoration:

The Healing Our Waters - Great Lakes Coalition

Friends of the St. Clair River

The Nature Conservancy

National Environmental Coalition on Invasive Species

Marine Aquarium Societies of North America

Conservation:

Wildlife Forever

Tip of the Mitt

Heart of the Lakes

Great Lakes Indian Fish & Wildlife Commission

Conservation Resource Alliance
Wisconsin Lakes
Land Trust Alliance

Partner Analysis

Industries (Manufacturing, Shipping, Fisheries, Recreation and Tourism)

Background

Manufacturing

The Great Lakes Region is a strong manufacturing marketplace. One-fifth of U.S. manufacturing and one-half of Canadian manufacturing are based here. In fact, the Detroit/Windsor border is the busiest and most valuable land transportation gateway in North America.

The Great Lakes region boasts the world's 4th largest economy, with a combined GDP of $4.7 trillion among the eight U.S. states (Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania and Wisconsin) and two Canadian provinces (Ontario and Quebec).[14]

The Great Lakes Region is home to diverse industries like Automotive, Consumer Products, Medical, Process Industries, Energy, Heavy Equipment, Aerospace and Transportation.

The region is a key international trade center and is home to more than 85,000 world-class manufacturers, including: Bombardier, Kellogg Company, Caterpillar, Magna International, Dow Chemical Company, Masco Corporation, Ford Motor Company, General Motor Company, Steelcase, General Dynamics, Stryker Corporation, General Electric, Whirlpool Corporation and

[14] The Smart Manufacturing Seminar Series. "Great Lakes Manufacturing." <http://bigmevent.com/great-lakes-region/>.

John Deere.[15]

Shipping

Over 200 million tons of cargo are shipped every year through the Great Lakes. The three main cargoes are iron ore, coal, and grain. [16]

Fisheries

Commercial and sport fisheries are important industries in the Great Lakes region. About 65 million pounds of fish per year are harvested from the lakes, contributing more than $1 billion to the Great Lakes economy. The commercial fishery in the region has been declining however, due to overfishing, pollution, habitat destruction, and introduction of invasive species.

Sport fishery contributes $4 billion to the economy. Sport fishery has also been responsible for the unintended introduction of some invasive species. Exotic fish such as salmon were purposely introduced to help boost the sport fishing industry.[17]

Recreation and Tourism

The Great Lakes region is home to many park systems, conservation and wilderness areas, and beaches. Fishing, diving, and boating are a few of the many recreational activities in the region. One-third of all registered boaters in the U.S. reside in the Great Lakes basin. Recreation and tourism serve as important economic contributors to many parts of the Great Lakes region. Boats, marinas, resorts, restaurants, and the production and sale of outdoor sports equipment, all contribute to the region's economy.[18]

Why do we focus on these industries?

With the advent of new administration, there is a popular belief that many U.S. manufacturers in Great Lakes region will move their production back because of possible tax cut and financial

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[15] The Smart Manufacturing Seminar Series. “Great Lakes Manufacturing.” <http://bigmevent.com/great-lakes-region/>.
[16] NOAA - GLERL. “About Our Lakes: Economy.” <https://www.glerl.noaa.gov/education/ourlakes/economy.html>.
[17] NOAA - GLERL. “About Our Lakes: Economy.” <https://www.glerl.noaa.gov/education/ourlakes/economy.html>.
[18] NOAA - GLERL. “About Our Lakes: Economy.” <https://www.glerl.noaa.gov/education/ourlakes/economy.html>.

punishment for moving jobs overseas. At the same time, huge spending on infrastructure with unraveling environmental regulations put in place by the Obama administration, particularly rules addressing climate change, has become a top priority for the Republican Congress and the new president. On January 24 President Trump signed two executive orders that would clear the way for the controversial Keystone XL and Dakota Access pipelines[19], as well as ordered the U.S. EPA to freeze its grants and contracts[20]. Just after 3 weeks, on February 17, the Senate confirmed Scott Pruitt to be President Donald Trump's administrator of the Environmental Protection Agency (EPA), a move that kicks off the president's push to roll back Obama-era climate and environmental regulations.

The return of manufacturing and construction of infrastructure in Great Lakes region would bring hope to the Shipping industry because of increased revenue sources and reduced cost. But for Fisheries, Recreation and Tourism, its effects are both positive and negative, the negative effects mainly come from the environment perspective: the possible water pollution, habitat destruction, and introduction of invasive species.

Will the Great Lakes encounter environmental degradation with the return of manufacturing and lowering environmental standards? For NOAA, one of the important researchers, protectors and stewards of the Great Lakes, how can it fulfill its mission of promoting sustainable prosperity and conserving and managing coastal ecosystems and resources when facing a changing political landscape?

We think challenges and opportunities coexist. If NOAA works closely with industries in Great Lakes region to address environmental challenges together, the economic boom could be achieved without degrading the environment.

[19] REUTERS. "Trump clears way for controversial oil pipelines." <http://www.reuters.com/article/us-usa-trump-pipeline-idUSKBN15820NI>.
[20] The Washington Post. "Trump administration tells EPA to freeze all grants, contracts." <https://www.washingtonpost.com/news/energy-environment/wp/2017/01/23/trump-administration-tells-epa-to-freeze-all-grants-contracts/?utm_term=.f6ebc87a4a52>.

Case Study

Gulf Coastal Plain Ecosystem Partnership (GCPEP)

Project Summary A partnership to protect and manage exceptional biodiversity across the 1 million acres of public-private land in Northwest Florida, while remaining consistent with the partner's individual and diverse missions.

Project Introduction

Northwest Florida is one of the most rapidly growing areas in the Nation. Intense development put its pristine coastal region under unprecedented pressure. Rapid growth and the loss of green space are creating serious encroachment issues for Eglin Air Force Base (AFB), Pensacola Naval Air Station (NAS), and NAS Whiting Field. The most serious issues include concerns about low level flights and weapons testing in the face of encroaching development.[21]

The area includes the largest remaining stands of natural longleaf pine forests and some of the last undeveloped coastline on the Gulf. The pine forests shelter rare and listed species, including the world's 4th largest population of the endangered Red-Cockaded Woodpecker. Conservation organizations have concerns about timber production and sustainable forestry, outdoor recreation, conserving biodiversity, wildlife management, and protecting water resources.[22]

The Gulf Coastal Plain Ecosystem Partnership (GCPEP), formed in 1996 via a Memorandum of Understanding, launched a joint planning process to conserve and restore the dwindling longleaf pine ecosystem, and to provide buffers for military lands. The seven public and private landowners agreed to work together to achieve that goal, and began the effort by enrolling over 840,000 acres of their lands in GCPEP. The partners recognized early on that success would depend upon both internal and external collaboration, and that there would have to be a focus on protection, restoration, management, and public outreach and education. Over the 20 years

[21] Cooperative Conservation America . "Cooperative Conservation Case Study." <http://www.cooperativeconservationamerica.org/viewproject.asp?pid=544>.
[22] Cooperative Conservation America . "Cooperative Conservation Case Study." <http://www.cooperativeconservationamerica.org/viewproject.asp?pid=544>.

since the partnership was formed, GCPEP has grown to thirteen partners and over 1.25 million acres. Non-government partners, which include company, conservation organization and private natural preserve have contributed funds and office space, and have provided volunteers, public outreach, and other services.[23]

The Partnership is guided by a Steering Committee which is composed of two representatives from each of the partner organizations, one primary and one alternative. The GCPEP Steering Committee operates under the Memorandum of Understanding and has agreed to guidelines that ensure efficient operation of the Partnership. In addition, the partnership developed a team of specialists called the Ecosystem Support Team (EST) to work across the entire landscape. The EST has been extremely successful with increasing management and restoration efforts, an especially significant success in light of increasingly limited partner resources.

Key partners

International Paper Company, Nokuse Plantation, Department of Defense (Naval Air Station and Eglin Air Force Base), The Nature Conservancy, The Longleaf Alliance, Florida Division of Forestry, Florida Department of Environmental Protection, Florida Fish and Wildlife Conservation Commission, Northwest Florida Water Management District, USDA Forest Service, Conecuh National Forest and the USDI National Park Service Gulf Islands National Seashore.[24]

Results and Accomplishments

The Gulf Coastal Plain Ecosystem Partnership covers more than one million acres. It is working to increase buffers around military reservations, improve biodiversity management, and assure green space and recreation opportunities for the region. Within the GCPEP landscape, protection, restoration, and management of longleaf pine has improved dramatically over that period. Its accomplishments include:

- Participating in the “Florida Greenways Project,” a multi-agency/organization initiative that is working to create a greenway from the Gulf of Mexico south of Tallahassee

[23] The Longleaf Alliance. “About GCPEP.” <http://www.longleafalliance.org/gcpep/about>.
[24] The Longleaf Alliance. “About GCPEP.” <http://www.longleafalliance.org/gcpep/about>.

through Eglin Air Force Base, Naval Air Station Pensacola, and Naval Air Station Whiting Field to Ocala National Forest further south.

- Completed land deals that have protected tens of thousands of acres immediately adjacent to the three Military installations.
- Supported scientific workshops to develop a regional strategic conservation plan.
- Created an Ecosystem Support Team for on-the-ground management. The team conducts ecological monitoring of key natural communities, has assisted with more than 39,000 acres of prescribed burning on GCPEP lands, and helped the partners with Hurricane Ivan relief.[25]

Potential cooperation opportunities between NOAA and industries

We think the cooperation opportunities between NOAA and industries in Great Lakes region could be:

1) Utilizing knowledge and service on weather & climate to help industries become "climate resilient" when facing challenges like extreme weather, fluctuating water levels and other hazard events caused by climate change, especially when industries build and manage assets in Great Lakes coastal region;

2) Utilizing knowledge and service on weather & climate and watershed management to help industries reduce storm water run-off to Great Lakes by building green infrastructures;

3) Utilizing knowledge and service on weather forecast, charting and satellite to help shipping industry avoid accidents and pollution in water transportation;

4) Utilizing knowledge on lakes and coastal management to help industries do wetland restoration and areas of concern clearing up projects in a more scientific manner;

5) Helping local recreation and tourism business like restaurants, groceries and souvenir shops benefit from restoration and conservation projects;

6) Utilizing the network resource to build the bridge between industries and restoration & conservation organizations;

7) Utilizing the resources and influences of industries to help more people understand the cause and effect of climate change;

[25] Cooperative Conservation America. "Cooperative Conservation Case Study." <http://www.cooperativeconservationamerica.org/viewproject.asp?pid=544>.

8) Utilizing the resources and influences of industries to prevent and control invasive species.

How do we select partners?

When considering industry partners, we think the following criteria are important:

1) Similar missions as NOAA to fuel economic prosperity and improve environmental quality in Great Lakes region. **20% weight of total 100 points**
2) Complementary strengths to NOAA, like market-based solutions and distribution networks, and have the capacity to share these resources. **20%**
3) Potential collaboration project can utilize NOAA's research, services and fund resources in Great Lakes.**15%**
4) Has influential connections to communities NOAA is trying to reach through its knowledge and services. **10%**
5) Has shared goal with NOAA from the partnership. **10%**
6) Has a history of successes in environmental protection or any sustainability project, especially working with government agency; **10%**
7) The potential economic, environmental, or social benefits can be measureable. **10%**
8) No historical greenwash (deceptive use of green PR and marketing). **5%**

Candidate list

Council of Great Lakes Industries

United States Business Council for Sustainable Development

Great Lakes Captains Association

Great Lakes Boating Federation

Council of Great Lakes Industries

http://cgli.org/

Topics for potential collaboration: Green Infrastructure, Coastal Management, Solutions to extreme weather, Wetland restoration, AOC (areas of concern) clearing up

Organization introduction:

CGLI represents the common interests of U.S. and Canadian industries in the manufacturing, utilities, transportation, communications, financial services and trade sectors that have significant assets in the Great Lakes basin. CGLI works to ensure that industry is a substantive partner in the public policy development process in the Great Lakes region.[26]

CGLI's mission is to promote the economic growth and vitality of the region in harmony with its human and natural resources (sustainable development).[27]

CGLI's Water Use and Quality Work Group focuses on industrial water stewardship, water conservation and efficiency, water recycling/reuse, and water infrastructure. The work group's policy focus is the Great Lakes Water Resources Compact and Agreement and the 2012 Protocol to the Great Lakes Water Quality Agreement. The work group agenda includes such activities as:

- Engaging in efforts to develop collaborative plans for addressing coastal resiliency, fluctuating water levels, and water quality;
- Monitoring analytical studies that evaluate the impact of water withdrawals and water quality impacts;
- Exchanging information about water treatment methods and technologies;
- Evaluating and exchanging best practices and other information about industrial water stewardship, conservation, efficiency and recycling;
- Monitoring developments in wastewater discharge permit programs and municipal treatment programs; and
- Evaluating, monitoring, and providing industry participation when possible in initiatives that address water quality.[28]

Project Example

Water stewardship project[29]

CGLI's water stewardship project was conceived in 2010. The objective of CGLI's water stewardship project is to identify a water use and management protocol for Great Lakes industry that incorporates the unique characteristics of the Great Lakes region, where water is abundant

[26] Council of Great Lakes Industries. "Mission & Vision." <http://cgli.org/mission-vision/>.
[27] Council of Great Lakes Industries. "Mission & Vision." <http://cgli.org/mission-vision/>.
[28] Council of Great Lakes Industries. "Water Use and Quality." <http://cgli.org/mission-vision/>.
[29] Council of Great Lakes Industries. "Industrial Water Stewardship." <http://cgli.org/mission-vision/>.

and regulatory mechanisms are mature.

The Great Lakes Protection Fund saw the potential of working with industry to identify, demonstrate, and promote regional action to enhance the health of the Great Lakes ecosystem, by evaluating and pilot testing water stewardship assessment tools.

Great Lakes industry participated in the development of the Compact and continues to work toward sustainable use of Great Lakes water resources. Five Great Lakes companies stepped up to participate in Phase III of CGLI's water stewardship project[30]:

- Escanaba Paper Company, a subsidiary of New Page Corporation, Escanaba, Michigan
- Consumers Energy JH Campbell Complex Power Plant, Pigeon Creek, Michigan
- Rock-Tenn Paper Mill, Battle Creek, Michigan
- Shell Canada Oil Refinery, Sarnia, Ontario
- LaFarge NA Cement Plant, Bath, Ontario

The project team consists of a diverse and knowledgeable group of dedicated professionals from various sectors, including LimnoTech (an Ann Arbor-based environmental consulting firm), the National Council on Air and Stream Improvement (the research arm of the pulp and paper industry), Jim Nicholas (Nicholas H2O), and others with deep expertise in industrial water stewardship. In the latest phase of the water stewardship project, this team worked closely with the Alliance for Water Stewardship to evaluate a beta version of its International Water Stewardship Standard. Final project outcomes were released in January 2015.

Why do we recommend Council of Great Lakes Industries to NOAA? (Partner analysis part)

Does the industry partner have similar missions as NOAA to fuel economic prosperity and improve environmental quality in Great Lakes region? 20%

Yes, CGLI's mission is to promote the economic growth and vitality of the region in harmony with its human and natural resources (sustainable development). 20 points

Does the industry partner have complementary strengths to NOAA, like market-based solutions and distribution networks and have the capacity to share these resources? 20%

[30] Council of Great Lakes Industries. "Phase III: Applying Water Stewardship Initiatives in the Great Lakes Basin." <http://cgli.org/mission-vision/>.

Yes. Among CGLI's members, there are a lot of famous companies, like DOW, DTE, Imperial Oil, which have significant Great Lakes assets. 20 points

Can the potential collaboration project utilize NOAA's research, services and fund resources in Great Lakes? 15%

Potential collaboration project can benefit a lot from NOAA, like the service on weather & climate, research on green infrastructure and funds for restoration projects. 15points

Does the partner have influential connections to communities NOAA is trying to reach through its knowledge and services. 10%

CGLI's members have thousands of suppliers, hundreds of thousands of employees and millions of consumers in Great Lakes region, which is a huge group NOAA can reach through its knowledge and service. 10points

Can NOAA and industry partner achieve the shared goal from the partnership. 10%

Yes, especially for projects like green infrastructure, climate resilience and wetland restoration. 8 points

The industry partner has a history of successes in environmental protection or any sustainability project, especially working with government agency; 10%

Yes, see the example project. 10 points

The potential economic, environmental, or social benefits can be measureable. 10%

It is hard but still possible. 5 points

No historical greenwash (deceptive use of green PR and marketing) record for the industry partner. 5%

No greenwash record. 5 points

Total score: 93

United States Business Council for Sustainable Development

http://usbcsd.org/

Topics for cooperation: Green Infrastructure, Wetland Restoration, Watershed Conservancy, Coastal Resilience

Organization introduction

The US BCSD is an action-oriented, member-led business association harnessing the power of collaborative projects, platforms and partnerships to develop, deploy and scale solutions to sustainability challenges in the U.S.[31] Current programs address ecosystems, energy, materials and water challenges.

US BCSD members are deeply involved in real projects like launching circular economy collaborations, designing multi-industry water reuse systems, and enabling energy efficiency in buildings. US BCSD build and grow strong partnerships - with the WBCSD (World Business Council for Sustainable Development), leading academic institutions, and progressive governments around the US.

[31] United States Business Council for Sustainable Development. “Main Page.” <http://usbcsd.org/>.

Industry Members

Figure 2: USBCSD industry members

Example project

Water synergy project[32]

For the past four years, the United States Business Council for Sustainable Development has been working with 23 diverse companies in the lower Mississippi River Basin to address a range of water supply, water quality, storm water and coastal resiliency risks. Companies are working together to address water quality concerns through design of a Water Quality Trading Program, and have explored new options for wetlands restoration through changes in water management. Projects and policy recommendations have emerged that have been greeted with high interest by state and local agencies, academia, and NGOs. This multi-sector teaming demonstrates that there is considerable regional interest in using the speed and efficiency of market-based institutions to seek out ways of converting water problems into economic opportunities, and to developing a collective capacity for conserving watershed systems as both private and public goods.

[32] United States Business Council for Sustainable Development. "Water Synergy Project." <http://usbcsd.org/water>.

Water issues are best addressed locally, but there are few forums where leaders from multiple industries can participate in focused interactions to identify issues, find and prioritize alternative solutions, and craft implementation plans for their region. The United States Business Council for Sustainable Development uses structured work processes (Figure 3) to provide a “safe” zone among companies to build trust and business relationships needed for information sharing that leads to inventive thinking and action.

Figure 3:US BCSD ‘s structured work processes

Why do we recommend United States Business Council for Sustainable Development to NOAA? (Partner analysis part)

Does the industry partner have similar missions as NOAA to fuel economic prosperity and improve environmental quality in Great Lakes region? 20%

Yes, US BCSD’s mission is give leading US businesses a platform to mobilize boots on the ground and work together to design, implement and scale sustainability solutions. But it is a national organization, not just focus on Great Lakes region. 15 points

Does the industry partner have complementary strengths to NOAA, like market-based solutions and distribution networks and have the capacity to share these resources? 20%

Yes. Among US BCSD’s members, there are a lot of famous companies, like GM, Coca Cola, Imperial Oil, which have significant Great Lakes assets. 20 points

Can the potential collaboration project utilize NOAA’s research, services and fund resources in Great Lakes? 15%

Potential collaboration project can benefit a lot from NOAA, like the service on w a range of water supply, water quality, storm water and coastal resiliency risks. 15 points

Does the partner have influential connections to communities NOAA is trying to reach through

its knowledge and services? 10%

US BCSD's members have thousands of suppliers, hundreds of thousands of employees and millions of consumers in Great Lakes region, which is a huge group NOAA can reach through its knowledge and service. 10 points

Can NOAA and industry partner achieve the shared goal from the partnership. 10%

Yes, especially for projects like green infrastructure, climate resilience and wetland restoration. 10 points

The industry partner has a history of successes in environmental protection or any sustainability project, especially working with government agency; 10%

Yes, see the example project. 10 points

The potential economic, environmental, or social benefits can be measurable. 10%

It is hard but still possible. 5 points

No historical greenwash (deceptive use of green PR and marketing) record for the industry partner. 5%

No greenwash record. 5 points

Total score: 90

Great Lakes Captains Association

http://www.glcaptains.com/page2.html

Topics for cooperation: Coastal Navigation, Coastal Health

Organization introduction

Originally organized because of the recognition of the need for commercial licensed boat operators to work together, the association seeks to promote safety, education, and good fellowship between operators and others with related interests. The association informs

members of events and programs that will help them in their jobs including updates and new rules to navigation. The association works with boat owners and companies so there will be more informed communication and stronger cooperation between them and the workforce leading to safer boating practices.[33]

Why do we recommend Great Lakes Captains Association to NOAA? (Partner analysis part)

Does the industry partner have similar missions as NOAA to fuel economic prosperity and improve environmental quality in Great Lakes region? 20%

Great Lakes Captains association seeks to promote safety, education, and good fellowship to captains in Great Lakes region. Its mission matches the goal of NOAA's Charting service, which is to increase ocean and coastal 'intelligence' and thereby improve the ability to navigate safely and make informed choices[34]. 15 points

Does the industry partner have complementary strengths to NOAA, like market-based solutions and distribution networks and have the capacity to share these resources? 20%

Yes. Great Lakes Captains association has many individual members, who can help distribute NOAA's information and knowledge. By utilizing their boats, captain also can help NOAA accomplish a wide range of marine tasks, like water pollution monitoring and reduction, nautical charting, and ocean and climate studies. 18 points

Can the potential collaboration project utilize NOAA's research, services and fund resources in Great Lakes? 15%

Potential collaboration project can benefit a lot from NOAA, like the charting service and weather forecast service . 15 points

Does the partner have influential connections to communities NOAA is trying to reach through its knowledge and services? 10%

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[33] Great Lakes Captains Association. "Home." <http://www.glcaptains.com/page2.html>.
[34] NOAA. "Charting." <http://www.noaa.gov/charting>.

The association has contact with members (such as boat owners and companies), and regularly informs them about events and programs that can help them in their jobs. A newsletter is published on a quarterly basis, and an annual Industry Days conference is held for people interested in the future of the marine industry. 10 points

Can NOAA and industry partner achieve the shared goal from the partnership. 10%
Yes, especially for projects like water pollution monitoring and reduction, nautical charting, and ocean and climate studies. 10 points

The industry partner has a history of successes in environmental protection or any sustainability project, especially working with government agency; 10%
Organizations who have worked before with GLCA include: United States Coast Guard, Great Wolf Lodge, Sault Printing. 8 points

The potential economic, environmental, or social benefits can be measureable. 10%
It is hard but still possible. 5 points

No historical greenwash (deceptive use of green PR and marketing) record for the industry partner. 5%

No greenwash record. 5 points

Total score: 86

Great Lakes Boating Federation

http://greatlakesboatingfederation.com/about-us/

Topics for cooperation: Coastal Navigation

Organization introduction: The Great Lakes Boating Federation is dedicated to serving recreational boaters on the Great Lakes and the inland waterways east of the Mississippi.

These needs range from voicing freshwater boaters' concerns in Washington, to providing member discounts at boating related businesses.[35]

The Great Lakes Boating Federation keep advancing boater's interests on a local, state, and regional level. The Federation is committed to defend 4.3 million registered boaters on the Great Lakes against any harsh and undue regulations affecting their ease and pleasure of boating.

The Federation is also committed to providing member discounts at the best vendors and providers of boating products and services. By partnering with businesses, we are able to provide privileges to our members while supporting the local economy.

Why do we recommend Great Lakes Boating Federation to NOAA? (Partner analysis part)

Does the industry partner have similar missions as NOAA to fuel economic prosperity and improve environmental quality in Great Lakes region? 20%
The Great Lakes Boating Federation is dedicated to serving recreational boaters on the Great Lakes. Since recreational boating serves as important economic contributors to many parts of the Great Lakes region, it is related to NOAA's work in this region. 10 points

Does the industry partner have complementary strengths to NOAA, like market-based solutions and distribution networks and have the capacity to share these resources? 20%
Yes. The Great Lakes Boating Federation has many individual members, who can help distribute NOAA's information and knowledge. By utilizing their boats, captain also can help NOAA accomplish a wide range of marine tasks, like fisheries research, nautical charting, and ocean and climate studies. 18 points

Can the potential collaboration project utilize NOAA's research, services and fund resources in Great Lakes?15%
Potential collaboration project can benefit a lot from NOAA, like the charting service and

[35] The Great Lakes Boating Federation. "About Us." <http://greatlakesboatingfederation.com/about-us/>.

weather forecast service. 15 points

Does the partner have influential connections to communities NOAA is trying to reach through its knowledge and services? 10%

GLBF voices the interests of its members and recreational boating. It also provides members with discounts at vendors and providers of boating products and services. GLBF also publishes boating-related articles. 10 points

Can NOAA and industry partner achieve the shared goal from the partnership. 10%

NOAA could help GLBF establish increased boating access, while GLBF could help NOAA in small scale mapping. In the past, GLBF has fought to preserve fish populations and prevent Asian Carp and other invasive from spreading into the Great Lakes, so there is potential for invasive species partnerships. In addition, GLBF is looking to get funding for a new study on the economic value of recreational boating on the Great Lakes, which could be useful for NOAA in achieving economic development objectives in the future. 10 points

Partner has a history of successes in environmental protection or any sustainability project, especially working with government agency; 10%

Previous partners with the GLBF include the US Coast Guard, Great Lakes Regional Collaboration (worked to establish recreational boating's economic impact and role in sustainable development). 5 points

The potential economic, environmental, or social benefits can be measurable. 10%

It is hard but still possible. 5 points

No historical greenwash (deceptive use of green PR and marketing) record for the industry partner. 5%

No greenwash record. 5 points

Total score: 78

Foundation

Background

On January 24, the Trump administration instructed officials at the Environmental Protection Agency to freeze its grants and contracts, a move that could affect everything from state-led climate research to localized efforts to restore degraded ecosystem and improve air and water quality.

From 2010 to 2016, the EPA awarded total $720 million in funding more than 900 Great Lakes restoration projects, while NOAA awarded $170 million in funding 224 projects[36]. For now, it appears, that funding is on hold, casting a cloud of uncertainty over many ongoing and future restoration projects, as well as over the scientists, state and local officials, universities and Native American tribes that often benefit from the grants.

Would a lot of Great Lakes restoration projects have to be shut down because of the suspension of federal funds? For NOAA, one of the important sponsors of Great Lakes restoration projects, how to continue its work in Great Lakes when facing the changed political landscape? Is it possible to involve sponsors like private or public foundation into restoration projects?

In addition, the average duration of restoration projects funded by EPA is 3.12 years, while projects funded by NOAA is 2.54 years.[37] Usually a federal government funded restoration project is declared a success once the short-time target is fulfilled. However, research shows it usually will take decades to fully recover a degraded ecosystem, which requires lengthy research and continuous monitoring, thus a huge investment. How to continue to restore the ecosystem after the short-time goal was achieved and withdrawal of federal funds?

In Great Lakes region, there are a lot of active private and public foundations, which sponsor many activities from strengthening communities, protecting natural environment, enhancing the arts, to transforming the lives of individuals and families. These foundations are empowered by their endowments giving them wide latitude in pursuit of their self-defined missions. As a result, these foundations are able to approach problems and dedicate resources to deeply entrenched

[36] Great Lakes Restoration. “GLRI Projects.” <https://www.glri.us/projects/index.html>.
[37] Great Lakes Restoration. “GLRI Projects.” <https://www.glri.us/projects/index.html>.

environmental problems in Great Lakes coastal region– which often intersect with those being addressed by NOAA– over a longer period of time without the constraints of politics and bureaucracy. In addition, many foundations have developed expertise and knowledge – through applied research and programs in Great Lake coastal region– that can be leveraged by NOAA as a way to design or experiment with new programs, and they have vast networks of individuals and institutions that can be used to help influence or implement NOAA policies and programs.

We believe the public-philanthropic partnership can broaden the reach of philanthropy's investments by creating an avenue for the federal government to leverage its initiatives with the missions of foundations.

Possible Cooperation Model 1 (Figure 4):

NOAA and foundation initiate a restoration project together, in which NOAA invests knowledge and research resources while foundation invests money and management expertise.

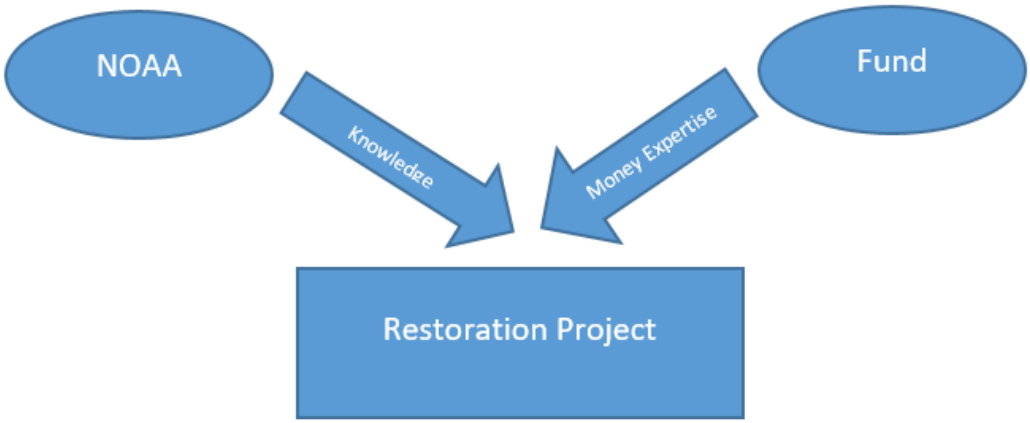

Figure 4: Cooperation Model between NOAA and Foundation NO.1

Possible Cooperation Model 2 (Figure 5):

Foundations generally look to address problems over longer time horizons than government, sometimes focusing on particular strategies for a decade or longer. Governments, by contrast, tend to look at problems in the context of electoral cycles.

Because of their longer view, foundations are more interested in gaining a more nuanced understanding of the underlying causes of a particular issue, and may be more attracted to partnerships that study or address root causes than those that merely attack the symptoms.

In this model, NOAA initiates a restoration project. Once the short time goal is achieved, federal funds pull out and then foundation add funding to ensure projects future success with intellectual support from NOAA.

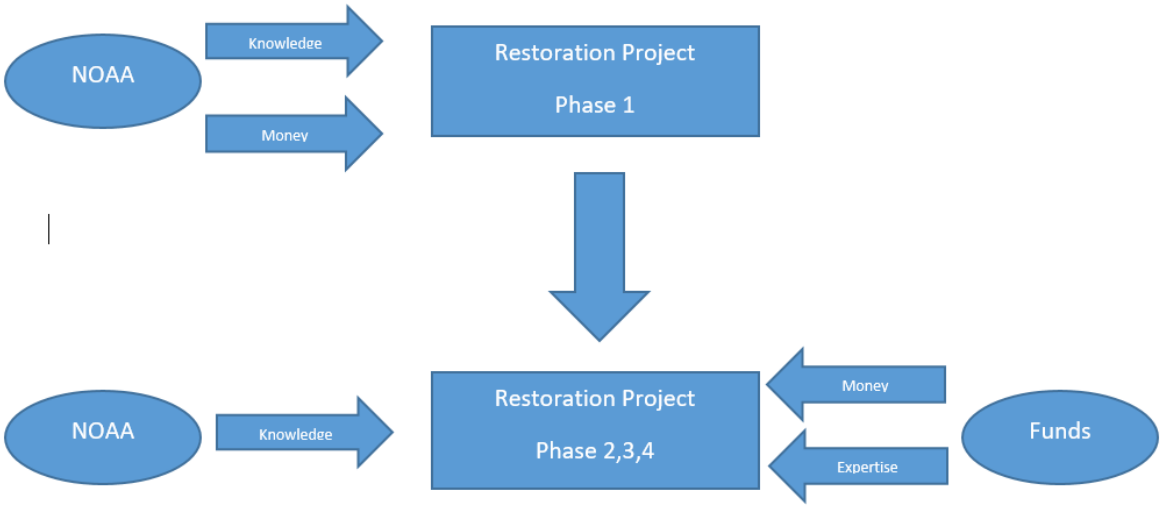

Figure 5: Cooperation Model between NOAA and Foundation NO.2

Possible Cooperation Model 3

NOAA provide knowledge resource to education projects sponsored by private foundation to help kids understand the cause and effect of climate change.

Case Study

Carbon Sequestration and Reforestation on National Forests[38]

The partnership between the USDA Forest Service (USFS) and National Forest Foundation (NFF) is designed to support reforestation projects on National Forest lands, while also helping organizations achieve greenhouse gas emission reductions through biological carbon sequestration. These actions are incentivized through the voluntary marketplace with an innovative program of the National Forest Foundation (NFF)—the Carbon Capital Fund.

The Carbon Capital Fund first started in 2008 with a pilot project on the Custer National Forest. Multiple years of experience has been accumulated with eight projects on four National Forests in USFS Regions 1, 2, and 5 (MT, CO, and CA). The NFF has facilitated eight carbon sequestration projects that cover 5,239 acres of national forest lands, which have involved planting 1,329,500 seedlings and are anticipated to offset more than 700,000 metric tons of carbon dioxide equivalents. These projects directly improve wildlife habitat and water quality, while mitigating the effects of climate change. The two most recent projects were established on the San Juan (2011) and Angeles (2012) National Forests and will be registered on the American Carbon Registry (ACR). Nearly $5 million in partner contributions have been raised to fund this initiative to date. Corporate partners to the NFF on this effort include the Walt Disney Company, the South Coast Air Quality Management District in California, El Paso Corporation, and Chevrolet.

Lessons from the partnership:

1) Foundation can engage informally with governments about needs and priorities, rather than approaching partnerships with rigid requirement.

[38] USDA. “High-Performance Partnership Report.” <https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3813398.pdf>.

2) Foundation can be nimble and responsive to needs as they emerge, and are often able to do so more rapidly than other.
3) Foundation can offer expertise and capacity, and collaborate with governments as knowledge partners.
4) Foundation can plan a convening role to help connect citizens with government agencies through public engagement processes.
5) Foundation can support civil society's critical role at the grassroots and national policy level, which complements direct engagement with governments.

How do we select partners?

When considering foundation partners, we think the following criteria are important:

1) Has similar mission as NOAA to help local communities and improve environmental quality. (20% of total 100 points)
2) Has complementary strengths to NOAA, like stable endowment and management expertise. (20%)
3) The potential collaboration project would utilize NOAA's research, services and fund resources in Great Lakes. (15%)
4) The foundation partner has influential connections to communities NOAA is trying to reach through its knowledge and services. (10%)
5) NOAA and foundation partner can achieve the shared goal from the partnership. (10%)
6) The foundation partner has previous successes in environmental protection or any sustainability project, especially working with government agency; (10%)
7) The potential economic, environmental, or social benefits can be measureable. (10%)
8) No historical greenwash (deceptive use of green PR and marketing) record for the industry partner. (5%)

Candidates:

Fred A. and Barbara M. Erb Family Foundation

Frey Foundation

The Brico Fund

Fund for Lake Michigan

Fred A. and Barbara M. Erb Family Foundation

http://www.erbff.org/

The Foundation's mission is to nurture environmentally healthy and culturally vibrant communities in metro Detroit, consistent with sustainable business models, and support initiatives to restore the Great Lakes Ecosystem[39]. The Foundation is focused on improving water quality, especially in the watersheds impacting metro Detroit and Bayfield, Ontario; promoting environmental health, justice and equitable development; and supporting the arts as a means to strengthen the metropolitan Detroit region. Annual grants budget is approximately $14 million.

When providing fund for projects in Great Lakes, desired outcomes include: Improved water quality in the Great Lakes, especially the watersheds impacting metro Detroit and Bayfield Ontario, through the elimination of polluted runoff and other threats, resiliency to climate change, and individual and institutional stewardship.[40]

The Foundation will consider support for activities that[41]:

1) Promote "green" infrastructure, primarily through low-impact development, to achieve community development as well as water quality goals;

2) Inform and engage individuals, business and government about how their daily activities, choices and policies can help improve their watershed;

3) Improve binational cooperation and policies on the Canadian and U.S. sides of the border to improve water quality; and Align environmental research, policy and practice to work toward a healthy Great Lakes.

[39] Fred A. and Barbara M. Erb Family Foundation. "Mission." <http://www.erbff.org/#Mission>.
[40] Fred A. and Barbara M. Erb Family Foundation. "What We Fund/Environment." <http://www.erbff.org/programs/#environment>.
[41] Fred A. and Barbara M. Erb Family Foundation. "What We Fund/Environment." <http://www.erbff.org/programs/#environment>.

Why do we recommend Erb Family Foundation to NOAA?

The foundation partner has a similar mission as NOAA to help local communities and improve environmental quality. (20% of total 100 points)

Yes, one of Erb Family Foundation's missions is to support initiatives to restore the Great Lakes, which is similar with NOAA's mission in this region. 20 points

The foundation partner has complementary strengths to NOAA, like stable endowment and management expertise. (20%)

Erb's annual grants budget approximately $14 million. It already sponsored a lot of water related projects in Metro Detroit region so has rich experience in grant monitoring and project outcome measurement. 20 points

The potential cooperation project would utilize NOAA's research, service and funding resource in Great Lakes. (15%)

Erb's ongoing and future green infrastructure projects could utilize NOAA's researches and services on weather forecast, climate change mitigation and water quality monitoring. 15 points

The foundation partner has influential connections to communities of influence and communities NOAA is trying to reach through its knowledge and services. (10%)

Erb has broad connections to Wayne, Oakland, and Macomb counties of Michigan. 8 points

NOAA and foundation partner can achieve the shared goal from the partnership. (10%)

We believe NOAA and Erb could achieve the shared goals like improving water quality in the Great Lakes by reducing stormwater runoff from metro Detroit area. 10 points

The foundation partner has previous successes in environmental protection or any sustainability project, especially working with government agency; (10%)

From 2011 to 2016, just for "Alliance For The Great Lakes" one organization, Erb granted total $195,000 to "move water-related local and regional planning forward to achieve on-the-ground results and policy improvements in Detroit while inspiring citizen engagement" 8 points

The potential economic, environmental, or social benefits can be measureable. (10%)

Yes. 8 points

No historical greenwash (deceptive use of green PR and marketing) record for the industry partner. (5%)

No historical greenwash record. 5 points

Total score: 96

Frey Foundation

http://freyfdn.org/

Edward and Frances Frey established Frey Foundation in 1974 out of a deep love of community and their commitment to philanthropy. Its mission is investing collaboratively in West Michigan to create a better place to live by strengthening its communities, protecting its natural environment, enhancing the arts, and transforming the lives of individuals and families.[42]

Frey Foundation's priority on environment include:

- Preserving and restoring significant lakes and streams
- Expanding and connecting regional trails and greenways
- Protecting critical lands including farmland, parkland, and natural habitat areas

Fund Programs include Conservation Resource Alliance and Tip of the Mitt Watershed Council.

Why do we recommend Frey Foundation to NOAA? (Partner analysis part)

The foundation partner has a similar mission as NOAA to help local communities and improve environmental quality. (20% of total 100 points)

Yes, one of Frey Foundation's missions is to support initiatives to protect natural environment in West Michigan, which is similar with NOAA's work in this region. 15 points

The foundation partner has complementary strengths to NOAA, like stable endowment and management expertise. (20%)

[42] Frey Foundation. "Who We Are." <http://freyfdn.org/about/>.

In 2015, Frey foundation granted approximately $6 million in West and Northern Michigan communities supporting innovative projects and programs to enhance child development, protect natural resources, promote the arts, and build a community. It is a main sponsor of Conservation Resource Alliance on projects like restore water quality in rivers and stabilize stream banks, remove old dams and culverts and improve habitat for fish. 18 points

The potential cooperation project would utilize NOAA's research, service and funding resource in Great Lakes. (15%)
Frey's ongoing and future stream restoration projects could utilize NOAA's researches and services on watershed management, climate change mitigation and water quality monitoring. 15 points

The foundation partner has influential connections to communities of influence and communities NOAA is trying to reach through its knowledge and services. (10%)
Frey has influential connections to West Michigan. 8 points

NOAA and foundation partner can achieve the shared goal from the partnership. (10%)
We believe NOAA and Frey could achieve the shared goals like improving water quality in the Great Lakes by restoring water quality in rivers and stabilizing stream banks in West Michigan. 10 points

The foundation partner has previous successes in environmental protection or any sustainability project, especially working with government agency; (10%)
Tip of the Mitt Watershed Council was founded 35 years ago to generate awareness of water quality issues. Fred Foundation has been working with it to repair and protect more than 2,500 miles of rivers and streams, 339,000 acres of wetlands and 1,800 lakes in Antrim, Charlevoix, Cheboygan, and Emmet Counties[43]. 8 points

[43] Frey Foundation. "Tip of the Mitt Watershed Council." <http://freyfdn.org/tip-of-the-mitt-watershed-council/>.

The potential economic, environmental, or social benefits can be measurable. (10%)
It is hard but still possible. 8 points

No historical greenwash (deceptive use of green PR and marketing) record for the industry partner. (5%)
No historical greenwash record. 5 points

Total score: 87

The Brico Fund

http://www.bricofund.org/

Brico Fund seeks a Wisconsin in which the full citizenry is engaged and involved in their communities, strengthening the human and natural environments for future generations[44]. Through dynamic approaches, Brico Fund builds the collective capacity of people and organizations to actively and sustainably improve the civic, cultural and natural environments. Most of its grants support organizations in Wisconsin, with a majority of our resources spent locally in Milwaukee and southeast Wisconsin. Its environment funding focuses on conservation of the natural environment of Wisconsin, and the safety and welfare for all citizens.

Fund's environmental funding support the following issues in Wisconsin[45]:
· Improvement and protection of water quality and quantity
· Reduction of disproportional impacts of pollution in disadvantaged communities
· Climate change mitigation and adaptation

Why do we recommend Brico Foundation to NOAA? (Partner analysis part)

The foundation partner has similar mission as NOAA to help local communities and improve environmental quality. (20% of total 100 points)
Yes, Brico Fund focuses on on water quality and conservation in Milwaukee and southeast

[44] The Brico Fund. "Who We Are." <http://www.bricofund.org/index.php/who/>.
[45] The Brico Fund. "Environment." <http://www.bricofund.org/index.php/grantmaking/environment/>.

Wisconsin, which is related to NOAA's work in this region. 15 points

The foundation partner has complementary strengths to NOAA, like stable endowment and management expertise. (20%)

In 2015, Brico Fund' total grant was $5 million. It has a set of well-defined criteria applied to application and a scientific evaluation process. It is particularly interested in supporting efforts that actualize innovative ideas and proven strategies to affect public policy, including, but not limited to, community organizing, advocacy and "high impact" litigation with the goal of achieving broad or precedent-setting results.[46] 15 points

The potential cooperation project would utilize NOAA's research, service and funding resource in Great Lakes. (15%)

Brico's ongoing and future stream restoration projects could utilize NOAA's researches and services on water quality improvement, climate change mitigation and pollution monitoring. 15 points

The foundation partner has influential connections to communities of influence and communities NOAA is trying to reach through its knowledge and services. (10%)

Brico has influential connections in Milwaukee and southeast Wisconsin. 8 points

NOAA and foundation partner can achieve the shared goal from the partnership.(10%)

We believe NOAA and Brico could achieve the shared goals like improving water quality in the Great Lakes by implementing green infrastructure in Wisconsin. 10 points

The foundation partner has previous successes in environmental protection or any sustainability project, especially working with government agency; (10%)

Milwaukee Riverkeeper is a organization to protect, improve and advocate for water quality, riparian wildlife habitat, and sound land management in the Milwaukee, Menomonee, and Kinnickinnic River Watersheds. As a major donors of Milwaukee Riverkeeper, Brico has been working with it on enforcing clean water laws, addressing threats to water quality and public

[46] The Brico Fund. "Environment." <http://www.bricofund.org/index.php/grantmaking/environment/>.

health and mobilizing a movement of river stewards. 10 points

The potential economic, environmental, or social benefits can be measurable. (10%)
Yes. 8 points

No historical greenwash (deceptive use of green PR and marketing) record for the industry partner. (5%)
No historical greenwash. 5 points

Total 86 points

Fund for Lake Michigan

http://www.fundforlakemichigan.org

The Fund for Lake Michigan is focused on making a profound impact on the health of Lake Michigan and its communities. It helps ensure the Lake continues to be both an economic powerhouse and an environmental treasure to the citizens of Wisconsin and the Midwest.

It's grants focus on projects that achieve tangible near-term and long-term results such as protecting critical natural habitats and making water resources more swimmable, fishable and drinkable in Lake Michigan.[47]

Why do we recommend Fund for Lake Michigan to NOAA? (Partner analysis part)

The foundation partner has similar mission as NOAA to help local communities and improve environmental quality. (20% of total 100 points)
The mission of the Fund for Lake Michigan is to support efforts, and in particular those in southeastern Wisconsin, that enhance the health of Lake Michigan and its shoreline and tributary river systems for the benefit of the people, plants and animals that depend upon the

[47] Fund for Lake Michigan. "Our purpose." <http://www.fundforlakemichigan.org/about-the-fund/our-purpose>.

system for water, recreation and commerce[48]. It's mission is similar to NOAA's work in the region. 20 points

The foundation partner has complementary strengths to NOAA, like stable endowment and management expertise. (20%)

Fund for Lake Michigan's projects not only improve the health of the Lake Michigan watershed, but also pay dividends in the economy by creating jobs, raising property values, and building demand for local products[49]. For the first five years of grantmaking, it invested $12 million and made a lot achievements including

1. Created the equivalent of 822 full-time, family-supporting jobs
2. Added $65 million to the local economy
3. Raised property values by $131 million in surrounding neighborhoods
4. Leveraged another $26 million in public and private investments in water quality[50]

20 points

The potential cooperation project would utilize NOAA's research, service and funding resource in Great Lakes. (15%)

Fund for Lake Michigan's projects could utilize NOAA's researches and services on water quality improvement, green infrastructure, flood reducing and habitat restoration. 15 points

The foundation partner has influential connections to communities of influence and communities NOAA is trying to reach through its knowledge and services. (10%)

Fund for Lake Michigan has influential connections in southeastern Wisconsin. It has diversified organization partners: trustees of the its Oversight Committee include utility representatives from We Energies, Madison Gas and Electric Company and Wisconsin Public Power Inc., and representatives from Clean Wisconsin, the Sierra Club, and the Wisconsin Department of Natural Resources. 10 points

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[48] Fund for Lake Michigan. "Mission & Values." <http://www.fundforlakemichigan.org/about-the-fund/our-purpose>.

[49] Fund for Lake Michigan. "Economic Impact." <http://www.fundforlakemichigan.org/impact/economic-impact>.

[50] Fund for Lake Michigan. "Economic Impact." <http://www.fundforlakemichigan.org/impact/economic-impact>.

NOAA and foundation partner can achieve the shared goal from the partnership.(10%)
We believe NOAA and Fund for Lake Michigan could achieve the shared goals including 1) Improving water quality in Lake Michigan by implementing green infrastructure and wetland restoration. 2) Benefiting the economy by creating jobs, raising property values, and building demand for local products 10 points

The foundation partner has previous successes in environmental protection or any sustainability project, especially working with government agency; (10%)
Fund for Lake Michigan partnered with the Redevelopment Authority of the City of Milwaukee to create a green storm water infrastructure system at the Reed Street Yards, a redevelopment along the Menomonee River that will treat all its storm water onsite. Using **PaveDrain**, a porous paving system built by a Greenfield company, the project demonstrates a cost-effective way for cities to manage storm water and decrease runoff and flooding — while also showcasing a locally-produced technology[51]. 10 points

The potential economic, environmental, or social benefits can be measureable. (10%)
Yes. 8 points

No historical greenwash (deceptive use of green PR and marketing) record for the industry partner. (5%)
No historical greenwash. 5 points

Total 98 points

[51] Fund for Lake Michigan. "Project Highlights." <http://www.fundforlakemichigan.org/impact/project-highlights>.

Coastal Management

Background:

Coastal management refers to the decisions and actions taken to keep the natural environment, built environment, quality of life, and economic prosperity of our coastal areas in balance. Currently, there is a broad range of coastal management issues. Coastal communities are trying to find the best ways to address storm preparedness, erosion, development, habitat loss, sea level rise, public access, threats to water quality, and other major issues. As a scientific organization, NOAA provides access to science and environmental intelligence for these communities.[52]

For NOAA, coastal management refers to actions taken to keep residents safe, the economy sound, and natural resources functioning. This is currently accomplished with federal and state partnership programs. Federal legislation provides overarching mandates, while federally approved state programs provide the day-to-day implementation.[53] NOAA's Office for Coastal Management oversees the implementation and provides technical assistance.

Digital Coast is a NOAA-sponsored website focused on helping communities address coastal issues and has become one of the most-used resources in the coastal management community. Digital coast provides coastal data and the tools, training, and information needed to effectively use the data. The data sets range from economic data to satellite imagery, and the website contains tools that make the data easier to find and use.[54] Previous examples of Digital Coast projects include helping coastal New Jersey improve its resiliency planning and aiding in the development of a flood risk tool to speed up the process for residents, business owners, and government officials estimating the risks.

In coastal management, NOAA's main goals are to mitigate the impact of development on coastal ecosystems and ensure the sustainable management of natural resources. To aid in

[52] Office for Coastal Management. "Protecting Coastal Communities". National Oceanic and Atmospheric Administration. <https://coast.noaa.gov/>.
[53] Office for Coastal Management: Protecting Coastal Communities
[54] Office for Coastal Management: Protecting Coastal Communities

these goals, NOAA can leverage resources such as Digital Coast. In addition, NOAA can look for businesses with coastal landholdings that could demonstrate best practices, in order to lead by example and recruit others to be good stewards of Great Lakes shorelines.

Potential cooperation opportunities between NOAA and coastal management

We think the cooperation opportunities between NOAA and coastal management partners in the Great Lakes region could:

1) Utilize Digital Coast for data resources and tools to help managers
2) Increase safety measures in places such as public beaches
3) Increase affordability of housing in coastal areas and decrease energy costs
4) Develop stormwater infrastructure to mitigate impacts of flooding
5) Apply coastal flooding visualizations to better understand causes of flooding hazards such as storms or lake levels
6) Support new zoning ordinances to protect public and private property from changes in lake levels and related coastal hazards
7) Protect specific sites that are deemed to be culturally significant to the area

Case Study: Communicating Coastal Flooding Risks Around the Great Lakes[55]

The Issue:

Green Bay, Wisconsin, residents are quite familiar with the flood risks associated with being a homeowner along Lake Michigan, but most lack the resources necessary to determine their home's proximity to potentially damaging floodwaters. Many homes have been built at unsafe distances from the shoreline, leaving residents susceptible to costly property damage from strong coastal storms.

Process:

Managers within the community sought effective ways to communicate the risk of flooding from coastal storms with local residents. Brown County staff members worked with personnel from the Association of State Floodplain Managers to gather photos of two residential properties that

[55] Office for Coastal Management. "Communicating Coastal Flooding Risks Around The Great Lakes". NOAA. <https://coast.noaa.gov/digitalcoast/stories/greenbay.html>.

were considered vulnerable to coastal flooding. The project team used the CanVis tool to create photorealistic visualizations of potential flooding and the impacts it would have on shore-abutting residences. Visualizations will be shared with residents to raise awareness of possible flooding scenarios caused by strong coastal storms.

Impact:
CanVis flood visualizations have given county staff members a go-to resource that can be shared with new or current residents inquiring about coastal flooding in Green Bay. From these visualizations, shoreline property owners will gain critical insight on how to protect themselves both physically and financially from coastal flooding hazards. Through the process, Brown County staff members gained valuable resources needed to communicate flood risks and encourage residents to make informed decisions about shoreline property. In the long term, these visualizations may encourage coastal resilience planning.

How do we select partners?

When considering coastal management partners, we think the following criteria are important:

1. **Similar mission** with NOAA to help local communities and improve environmental quality (20%)
2. Can help with **sustainable management** of coastal resources (15% weight)
3. Measurable **economic benefits** to the area (15%)
4. Able to **increase resiliency** in a community (i.e., mitigate erosion impacts) (15%)
5. Has coastal landholdings and could **demo best practices** (leading by example) (10%)
6. **Increase public access** to coastal areas (10%)
7. Expertise in **Green Infrastructure** (10%)
8. Helps to **preserve maritime and cultural heritage sites** (5%)

Center for Neighborhood Technology

http://www.cnt.org/

Categories: Green infrastructure, Coastal Management

The Center for Neighborhood Technology is a nonprofit research and advocacy organization

committed to improving urban economies and environments across the United States. There are multiple areas of work. CNT improves transportation infrastructure, using improvements to transit, pedestrian, and bike systems while lowering dependence on cars. CNT uses innovative ways to manage water policies to help secure residences and businesses in the face of extreme weather events. CNT seeks to transform traditional economic development and poverty alleviation strategies by creating resource efficiencies in areas like water and energy to make communities more equitable and resilient and lower the cost of living.

As part of the Smart Water for Smart Regions initiative, CNT works with communities across Great Lakes states to alleviate urban flooding.[56]

Why do we recommend Center for Neighborhood Technology to NOAA? (Partner analysis part)

Similar mission with NOAA to help local communities and improve environmental quality (20%)
The Center for Neighborhood Technology is a nonprofit research and advocacy organization committed to improving urban economies and environments across the United States. CNT does this through innovation and by researching and analyzing urban problems, testing and promoting economically efficient and environmentally sound solutions, and demonstrating the value of investing in sustainable solutions. When CNT was started in 1978, its two visionaries argued for addressing environmental issues much closer to home - on the ground, in communities - as a way to improve the lives and economic prospects of city residents. 20 points.

Can help with **sustainable management** of coastal resources (15% weight)
CNT advances urban sustainability through initiatives in transportation, water, climate, and public policy. CNT works to expand and improve transit, pedestrian and bike systems for walkable communities, and lowering dependence on cars. For water, CNT provides blueprints for water management and services, and also propose legislation and alliances to promote more sustainable policies and practices. Programs such as the RainReady Initiative helps

[56] Center for Neighborhood Technology. “Vision + Mission”. <http://www.cnt.org/vision-and-mission>.

homeowners and municipalities save money by installing green infrastructure solutions such as rain gardens and bioswales for stormwater management. 15 points.

Measurable economic benefits to the area (15%)
CNT's Sustainable Prosperity program is a national initiative build on local economies' unique assets to address challenges and provide quantifiable real-world benefits. The Sustainable Prosperity framework identifies cities' specific needs and potential opportunities, and uses these to decrease poverty and bolster economic and environmental resilience. This helps raise incomes and decrease household costs by increasing resource efficiencies, improving access to jobs and services, and creating new jobs.

Example projects:

- Elevate Energy helps keep housing costs down and reduce demand for energy.
- Neighborhood Early Warning System spotlighted indicators of housing problems. H+T Affordability Index.
- Equity Express helps lower income households learn to save money by going green.

15 points.

Able to **increase resiliency** in a community (i.e., mitigate erosion impacts) (15%)
CNT can help flood-proof homes, and district-scale solutions like EcoDistricts make infrastructure better able to withstand disasters and disruptions. 15 points.

Has coastal landholdings and could **demo best practices** (leading by example) (10%)
CNT has worked with city governments to demo best practices. 7 points.

Increase public access to coastal areas (10%)
CNT promotes transit-oriented development, which creates walkable and connected communities where people can own fewer cars and live closer to schools, jobs, markets, and other locations. 6 points.

Expertise in **Green Infrastructure** (10%)

Previous projects include:

- Rooftop gardens and greenhouses in poor communities to help residents grow their own food
- RainReady to address increased urban flooding and stormwater management

10 points.

Helps to **preserve maritime and cultural heritage sites** (5%)

Example: In 1991, CNT helped convince the Chicago Transit Authority to save the Green Line by showing how the Green Line is a connector of communities that deserves investment and prioritization. 4 points.

Total score: 92

Milwaukee Metropolitan Sewerage District

http://www.mmsd.com/

Category: Coastal Management, Green Infrastructure

MMSD is a regional government agency that provides water reclamation and flood management services for about 1.1 million people in 28 communities in the Greater Milwaukee Area. Since 1994, MMSD has captured and cleaned more than 98% of all stormwater and wastewater that has entered the regional sewer system. MMSD serves 411 square miles that cover all, or segments of, six watersheds. Established by state law, the District is governed by 11 *commissioners* with taxing authority.[57]

MMSD also has services for water quality research, household hazardous waste, medicine collection, rain barrels, green infrastructure, greenseams, sustainability, planning, engineering, laboratory services, and industrial waste monitoring.

[57] Milwaukee Metropolitan Sewerage District. "About MMSD". <https://www.mmsd.com/about-us>.

Why do we recommend Milwaukee Metropolitan Sewerage District to NOAA? (Partner analysis part)

Similar mission with NOAA to help local communities and improve environmental quality (20%)
MMSD is a regional government agency that provides water reclamation and flood management services for about 1.1 million people in 28 communities in the Greater Milwaukee Area. MMSD seeks to protect public health and the drinking supply for people in the region. MMSD's vision is a healthier Milwaukee region and a cleaner Lake Michigan accomplished through its leadership in attaining zero overflows, zero basement backups, and improved storm water management. MMSD seeks to be a model in its management of climate change impacts on wet weather and its focus on energy efficient and sustainable operations. 20 points.

Can help with **sustainable management** of coastal resources (15% weight)
MMSD provides water reclamation and flood management services for the Greater Milwaukee Area. MMSD also works in Green Infrastructure, including the FreshCoast740 program, which helps to capture stormwater and protect basements, sewers, and area waterways. MMSD offers collection of household hazardous waste, collection of medicine, rain barrels (purchase and installation), and industrial waste monitoring. 15 points.

Measurable **economic benefits** to the area (15%)
MMSD aids in the economic development of the Milwaukee area through the SWMBE and WDTP programs, as well as the support of M7's regional economic development plan. 15 points.

Able to **increase resiliency** in a community (i.e., mitigate erosion impacts) (15%)
MMSD has invested hundreds of millions of dollars to reduce flooding in the area. Projects include capturing and storing millions of tons of stormwater to reduce risk of flooding when storms arrive, having temporary storage areas for stormwater during floods. 15 points.

Has coastal landholdings and could **demo best practices** (leading by example) (10%)
MMSD operates two water reclamation facilities through a private contract operator that serve 411 square miles. 5 points.

Increase public access to coastal areas (10%)
MMSD can provide speakers for topics such as how to protect Lake Michigan, sustainability, hazardous waste collection, and environmental issues. 5 points.

Expertise in **Green Infrastructure** (10%)
The FreshCoast740 program helps to capture stormwater and protect basements, sewers, and area waterways. MMSD offers collection of household hazardous waste, collection of medicine, rain barrels (purchase and installation), and industrial waste monitoring. 10 points.

Helps to **preserve maritime and cultural heritage sites** (5%)
Storm mitigation capabilities can help in this area. 3 points.

Total score: 88

Great Lakes Beach Association

http://www.glin.net/glba/about.html

Category: Coastal Health

The Great Lakes Beach Association (GLBA) is presently made up of individuals from across the US and Canada, as well as from several other countries. Local, county, provincial and state public health, regulatory agencies, coordinating agencies, researchers and environmental groups are among the groups involved. The GLBA began in 2001 in response to the need for a forum to discuss beach issues and share ideas for achieving cleaner beaches. The GLBA is an informal organization. There are no membership dues.[58]

[58] Great Lakes Beach Association. "About us". <http://www.glin.net/glba/about.html>.

Why do we recommend Great Lakes Beach Association to NOAA? (Partner analysis part)

Similar mission with NOAA to help local communities and improve environmental quality (20%)
The purpose of GLBA is to work together to improve recreational beach water quality. GLBA's mission is the pursuit of healthy beach water conditions in the Great Lakes area. GLBA strives to develop and encourage collaborations and maximize resources to achieve its purpose. 20 points.

Can help with **sustainable management** of coastal resources (15% weight)
GLBA hosts the Great Lakes Beach Association Conference, where people can hear from top experts about the current status and science behind Great Lakes beaches, successful beach restoration projects, Best Management Practices for beaches, and waterfront transformations.

GLBA is involved in several other events. Among events scheduled for 2017 are:

- Training workshop surveying Rouge wetlands for frogs/toads to help assess wetland health.
- Conference on how to capture crop nutrients and organic inputs for crop use and soil health
- Insect collecting event to assess health of the Huron River system
- Symposium for assessing river ecosystem challenges in a changing environment

15 points.

Measurable **economic benefits** to the area (15%)
GLBA discusses best management practices for beaches at conferences. Improving beach quality can also increase public interest in visiting beaches, resulting in economic boost from tourism. 12 points.

Able to **increase resiliency** in a community (i.e., mitigate erosion impacts) (15%)
GLBA discusses best management practices, waterfront transformations, health assessments of coastal systems. 12 points.

Has coastal landholdings and could **demo best practices** (leading by example) (10%)
Some members in the association have coastal properties. 6 points.

Increase public access to coastal areas (10%)
The association discusses beach issues and how to achieve cleaner beaches. GLBA can also utilize more outreach to inform people how beach quality is being improved and is safer, which serve to tell people how to visit beaches. 10 points.

Expertise in **Green Infrastructure** (10%)
Partner doesn't seem to work in this area specifically, but some members in association may have expertise. 3 points.

Helps to **preserve maritime and cultural heritage sites** (5%)
GLBA helps to preserve beaches through collaborations. 5 points.

Total score: 83

Great Lakes Surf Rescue Project

http://www.glsrp.org/

Category: Coastal Health, Coastal Management

GLSRP's mission is to be the leader in Great Lakes water safety and reduce the number of Great Lakes drownings through training, public preparedness, and public awareness. Its vision is that everyone, nationwide and worldwide, is knowledgeable, engaged and proactive in water safety with an emphasis on the Great Lakes region.[59]

Activities:

- Track Great Lakes drowning statistics

[59] Great Lakes Surf Rescue Project. "About Us". <http://www.glsrp.org/about-us/>.

- Teach “Great Lakes Water Safety” classes and presentations
- Host Open Water Surf Lifeguard Certification training
- Work with family and friends of Great Lakes drowning victims to advocate water safety

Why do we recommend Great Lakes Surf Rescue Project to NOAA? (Partner analysis part)

Similar mission with NOAA to help local communities and improve environmental quality (20%)
GLSRP seeks to save lives and reduce number of drownings in the Great Lakes. 20 points.

Can help with **sustainable management** of coastal resources (15% weight)
GLSRP doesn’t seem to work in this area specifically. 0 points.

Measurable **economic benefits** to the area (15%)
GLSRP can encourage more people to visit beaches by making them safer to use, as well as reduce the costs that come with losing members of the community to drownings. 8 points.

Able to **increase resiliency** in a community (i.e., mitigate erosion impacts) (15%)
Save lives, increase human preparedness for heavy floods and storms. 10 points.

Has coastal landholdings and could **demo best practices** (leading by example) (10%)
Very limited. 0 points.

Increase public access to coastal areas (10%)
GLSRP makes beaches more accessible by providing more knowledge about how to safely use beaches through preparedness and awareness. Activities such as water safety classes and lifeguard certification training can help make beaches safer for the public. 10 points.

Expertise in **Green Infrastructure** (10%)
Doesn’t seem to work in this area. 0 points.

Helps to **preserve maritime and cultural heritage sites** (5%)
Can help increase public confidence in visiting coastal areas, which can lead to increased importance placed on heritage sites. 3 points.

Total score: 51

Education

Background:

Educational partners are important to help advance NOAA's educational goals and objectives. As the leading science and service agency in oceanic and atmospheric science, NOAA has a responsibility to increase its role as a coordinator and collaborator in areas of science education. NOAA has several core models of previous partnerships, including informal education institutions, nonprofit institutions, and locally-based partnerships.[60]

Partnerships with informal education institutions includes partnerships with organizations such as zoos, aquariums, and museums. Informal educational institutions help NOAA by increasing access and reach to broader audiences and diverse populations, distributing information on issues important to NOAA, and facilitating broader impacts of NOAA science and scientists. Constant communication between specific points of contact for each partner are integral to the success of these types of partnerships, to help sustain the partnership and capitalize on opportunistic collaborations.

Partnerships with nonprofit institutions are generally more targeted than partnerships with informal education institutions in terms of audience and content. These kinds of partnerships have resulted in long-term involvement of partners and participants, products that can be leveraged for additional support from other federal agencies and partners, and involvement of recognized celebrities in the support and promotion of products.

[60] Payne, D.L., Baek, J.Y. (2014). "NOAA Education Partnerships 2013 Portfolio Review: Final Report". <http://www.noaa.gov/sites/default/files/atoms/files/Partnerships2013PortfolioReview-FinalReport.pdf>.

Partnerships with a focus on local issues allow NOAA to capitalize on interest in local issues directly connected to agency mission and goals, encourage local and sustainable collaboration among scientists, educators, volunteers, and others on common community issues, and leverage local funding and resources. In these types of partnerships, it is vital to foster strong personal relationships between key individuals knowledgeable about the local issues and the leveraging of in-kind support of resources.

Potential cooperation opportunities between NOAA and education

We think the cooperation opportunities between NOAA and education partners in the Great Lakes region could:

1) Utilize NOAA's expertise in oceanic and atmospheric science to increase public awareness and knowledge of environment and sustainability
2) Co-develop exhibits, education, and public programs
3) Develop research programs focused on issues critical to NOAA
4) Establish new learning programs for students in grades K-12
5) Engage the public in citizen science efforts
6) Provide grant funding for science-related education programs

Case Study: Project Shiphunt[61]

On July 13, 2011, the Thunder Bay National Marine Sanctuary (NMS) announced the discovery of two Great Lakes shipwrecks. The discoveries were part of Project Shiphunt, an exciting archaeological expedition, sponsored by Sony and the Intel Corp, that included five high school students from Saginaw, Michigan.

In May, the students undertook the adventure of a lifetime: hunt for a shipwreck, investigate its identity, and document it in 3D for future generations. Accompanied by a team of scientists and

[61] Thunder Bay National Marine Sanctuary. "Project Shiphunt". National Marine Sanctuaries - NOAA. <http://thunderbay.noaa.gov/shiphunt.html>.

historians from the National Oceanographic and Atmospheric Administration (NOAA), the students conducted a full-fledged research mission, as they searched the deep waters of northeastern Lake Huron. The team also worked with scientists from Woods Hole Oceanographic Institute, NOAA's **Office of Coast Survey**, and **Great Lakes Environmental Research Laboratory** to investigate the historically significant shipwrecks.

The team located the 138-foot schooner M.F. Merrick. In 1889, the schooner collided with a passing steamer in a dense fog. The Merrick sank immediately, and claimed the lives of five crew members, including a female cook. Today, the intact hull of the schooner rests upright on the bottom of Lake Huron.

The wreck of the steel freighter Etruria was also discovered and identified by the researchers. Launched in February 1902 at West Bay City, Michigan, the 414-foot long Etruria sank in 1905, after colliding with a steamer in thick fog. Today, the massive steamer sits upside down in deep water.

Project Shiphunt will be chronicled in documentary that will be released on August 30. Sony and Intel Corp. are also partnering with the sanctuary on a comprehensive educational curriculum for high school science and history teachers.

The project represents the first time Thunder Bay area shipwrecks have been filmed in 3D, and the team is working to incorporate the new data into the exhibits at the sanctuary's Great Lakes Maritime Heritage Center.

According to sanctuary superintendent Jeff Gray, the discoveries are an exciting opportunity to better understand the Great Lakes. "This research will help us protect the Great Lakes and their rich history for future generations. It is also an extraordinary opportunity to inspire the next generation of explorers and introduce them to technology and experiences that could shape their futures," said Gray.

Great Lakes shipwrecks are among the best preserved in the world. Lake Huron's cold, freshwater has kept many Thunder Bay sites virtually unchanged for over 150 years. Through research, education and community involvement, the sanctuary works to protect our nation's historic shipwrecks for future generations, while providing access to recreational users. The

sanctuary will continue to investigate the new shipwrecks and will work with the State of Michigan to provide location information so divers can access the new sites.

How do we select partners?

When considering education partners, we think the following criteria are important:

1. **Direct connections** to communities of influence (i.e. schools) (25% weight)
2. **Mission** related to education (15%)
3. Educational projects can be **science-focused** (15%)
4. Ability to assist with **outreach efforts** to the public (15%)
5. Access to **under-served and/or under-represented** communities (15%)
6. Potential to assist in **citizen science efforts** (10%)
7. **History of success** in partnerships with government agencies (5%)

Michigan Association of Non-Public Schools (MANS)

http://m-a-n-s.org/about-mans

Category: Information distributor, Outreach/Education

MANS is recognized as the essential voice advancing equity and excellence for all of Michigan's faith-based, Christ-centered schools.[62]

MANS convenes Christian educational leaders from multiple faith traditions to:

- Advocate for and empower faith-based administrators toward excellence
- Advocate for faith-based schools with public policy makers
- Raise visibility, value, and awareness of faith-based schools
- Provide resources for quality instruction and managerial practice that enhance faith-based education

[62] Michigan Association of Non-Public Schools. "About MANS". <http://m-a-n-s.org/about-mans>.

Why do we recommend Michigan Association of Non-Public Schools to NOAA? (Partner analysis part)

Direct connections to communities of influence (i.e. schools) (25% weight)
MANS members include hundreds of faith-based, Christ-centered schools in Michigan. 25 points.

Mission related to education (15%)
MANS is recognized as the essential voice advancing equity and excellence for all of Michigan's faith-based, Christ-centered schools. MANS helps provide resources for quality instruction and managerial practice that enhance faith-based education. 15 points.

Educational projects can be **science-focused** (15%)
Potentially, but some of the more controversial topics may be best avoided. The Utilities Energy Program helps member schools alleviate rising energy costs a number of ways, including through conservation projects. This may include upgrading boilers, installing higher quality and more efficient lighting, adding insulation and replacing windows. 12 points.

Ability to assist with **outreach efforts** to the public (15%)
NOAA could potentially work with MANS locating target schools and collaborating on a project to provide environmental education to students, from issues like green infrastructure to habitat restoration. This can help students understand the gravity of some of the environmental issues right now in the world. 8 points.

Access to **under-served and/or under-represented** communities (15%)

Connections to hundreds of Christ-centered schools gives NOAA more opportunities to find underrepresented communities. 15 points.

Potential to assist in **citizen science efforts** (10%)

Educational projects could involve students helping NOAA collect information about a phenomenon, while gaining valuable learning experiences. 10 points.

History of success in partnerships with government agencies (5%)
MANS provides a framework for communication among government agencies, non-public and public educators of all levels. MANS facilitates member schools with participation in federal programs and other government sponsored programs.

Previous partners include: Meemic Foundation, OK2SAY. 3 points.

Total score: 88

Michigan Association of School Boards

http://www.masb.org/about-masb.aspx

Category: Information distributor, Outreach/Education

The Michigan Association of School Boards is a voluntary, nonprofit association of local and intermediate boards of education located throughout the State of Michigan. Our membership is comprised of 600+ boards of education, representing nearly all public school districts in the state. The mission of MASB is to provide quality educational leadership services for all Michigan boards of education, and to advocate for student achievement and public education.

MASB was officially organized in 1949 to advance the quality of public education in our state, promote high standards in providing educational programs, help school board members keep informed about education issues, represent the interests of boards of education, and promote public understanding about school boards and citizen involvement in our schools.

Today, MASB is recognized as a major voice influencing education issues at the state level. Through its federation with the National School Boards Association, MASB and its members also have an impact at the national level.[63]

[63] Michigan Association of School Boards. "About MASB". <http://www.masb.org/about-masb.aspx>.

Why do we recommend Michigan Association of School Boards to NOAA? (Partner analysis part)

Direct connections to communities of influence (i.e. schools) (25% weight)
MASB is comprised of over 600 boards of education, representing nearly all public schools in Michigan. 25 points.

Mission related to education (15%)
The mission of MASB is to provide quality educational leadership services for all Michigan boards of education, and to advocate for student achievement and public education. 15 points.

Educational projects can be **science-focused** (15%)
NOAA could potentially work with MASB on a project to provide environmental education to students, from issues like green infrastructure to habitat restoration. This can help students understand the gravity of some of the environmental issues right now in the world. 15 points.

Ability to assist with **outreach efforts** to the public (10%)

Yes, by educating students about environmental issues. Some more controversial topics may be best avoided. 12 points.

Access to **underserved and/or under-represented** communities (15%)
MASB's access to hundreds of school boards in Michigan may make it easier to locate suitable schools for NOAA partnerships, such as schools in areas that are underserved or underrepresented. 15 points.

Potential to assist in **citizen science efforts** (10%)
Projects could potentially involve students helping to collect scientific experience. This helps provide an educational experience in the sciences, while helping NOAA collect information. 8 points.

History of success in partnerships with government agencies (5%)
Michigan partners include Center for Educational Performance and Information (CEPI),

Michigan Association of School Administrators (MASA), and Michigan Department of Education (MDE). National partners include U.S. Department of Education and U.S. House of Representatives. 5 points.

Total score: 90

Project Grow

http://projectgrowgardens.org/

Category: Education

Project Grow's core focus is facilitating organic community garden sites throughout Ann Arbor. The program provides Ann Arbor – area residents with the space and knowledge to grow their own fresh, organic food. Project grow identifies under-developed land, arranges for its use, and maintains it as part of their network of community gardens. Each site offers a variety of plot types that accommodate diverse gardeners. All of Project Grow's sites use sustainable practices. Classes and programs are offered on gardening-related topics. Lessons may range from preserving the harvest to practical advice on organic composting. Project Grow is a private, non-profit organization that relies on the support of the community for volunteer help, equipment donations, and funding.[64]

Why do we recommend Project Grow to NOAA? (Partner analysis part)

Direct connections to communities of influence (i.e. schools) (25% weight)
Project Grow could increase NOAA's access to people interested in green food and developing green infrastructure. 20 points.

[64] Project Grow Community Gardens. "What we do". <http://projectgrowgardens.org/about-us/what-we-do>.

Mission related to education (15%)

Project Grow provides Ann Arbor - area residents with knowledge about how to grow their own organic food. 10 points.

Educational projects can be **science-focused** (15%)

Some of Project Grow's current lessons are on topics such as harvest preservation and organic composting. 8 points.

Ability to assist with **outreach efforts** to the public (15%)

Issues a newsletter to members on organic gardening. It provides information on events and classes, gardening tips, and volunteer opportunities. 10 points.

Access to **under-served and/or under-represented** communities (15%)

NOAA would probably need to use its resources to identify such communities in the Ann Arbor, and work with Project Grow to set up a program with these communities on organic gardening. 12 points.

Potential to assist in **citizen science efforts** (10%)

Members may be able to help through tasks such as natural soil improvement and land stewardship. 8 points.

History of success in partnerships with government agencies (5%)

Landowners Project Grow gardeners have worked with include:

- Ann Arbor Public Schools
- Ann Arbor Parks and Recreation
- City of Ann Arbor
- Catholic Social Services
- Washtenaw County Parks and Recreation
- Leslie Science and Nature Center
- University of Michigan and the Matthaei Botanical Gardens

5 points.

Total score: 73

Great Lakes Aquarium

http://glaquarium.org/about-us/

Category: Education

The mission of Great Lakes Aquarium (GLA) is to "inspire people to explore their connection to Lake Superior and waters of the world." GLA is a not-for-profit 501(c)3 organization.

Previously known as Lake Superior Center, the Great Lakes Aquarium has been located on the Duluth Waterfront since 2000. The Aquarium features animals and habitats found within the Great Lakes Basin as well as animals from other freshwater ecosystems such as the Amazon River. It also features a Global gallery designed to interpret marine (saltwater) animals and habitat. *Shipwrecks Alive!*, opened in the Global gallery in July 2014. *Unsalted Seas*, home to North America's largest sturgeon touch tank, opened in a new gallery on the bay in 2016.

Great Lakes Aquarium provides on-site and outreach educational programming to learners of all ages. Daily interpretive programs give guests the opportunity to learn more about resident animals while watching them eat, play or interact with our staff. In addition, classes and formal programming are provided to more than 10,000 pre-K-12 grade students each year. Interactive Video Conferencing is available to schools as well. Teacher workshops and visiting speakers provide enriching experiences for adults.[65]

[65] Great Lakes Aquarium. "About Us". <http://glaquarium.org/about-us/>.

Why do we recommend Great Lakes Aquarium to NOAA? (Partner analysis part)

Direct connections to communities of influence (i.e. schools) (25% weight)
NOAA could gain access to groups that visit GLA, including K-12 students, educators, and speakers. 25 points.

Mission related to education (15%)
Great Lakes Aquarium would like to inspire people to explore their connection with Lake Superior and the waters of the world, so that people value and protect these waters. 12 points.

Educational projects can be **science-focused** (15%)
One of GLA's values is the promotion of Lake Superior-oriented scientific research, and to act as a conduit for sharing this research with the public. GLA is seeking collaboration with partners to strengthen community assets and enhance its own educational programming. 15 points.

Ability to assist with **outreach efforts** to the public (15%)
There is on-site and outreach educational programming to learners of different ages. Interpretive programs allow guests to learn about resident animals. Classes and formal programming are provided to more than 10,000 pre-K-12 grade students each year. Interactive Video Conferencing is available to schools. For adults, there are teacher workshops and visiting speakers. 15 points.

Access to **under-served and/or under-represented** communities (15%)
NOAA could gain access to these communities by using GLA's networks. 10 points.

Potential to assist in **citizen science efforts** (10%)
Working with GLA's research partners, or setting up volunteer programs on issues relating to both GLA and NOAA. 7 points.

History of success in partnerships with government agencies (5%)

Minnesota Sea Grant Program

University of Minnesota Duluth

Minnesota Power

City of Duluth

4 points.

Total Score: 88

Restoration

Background:

The NOAA Restoration Center's work in the region is focused on supporting community-identified restoration priorities in **Areas of Concern**—environmentally degraded areas within the Great Lakes basin. Much of this work is supported through the President's **Great Lakes Restoration Initiative** and aims to improve fish passage, clean up marine debris, restore coastal wetlands, and remove invasive species. The Restoration Center also works to protect and restore Great Lakes coastal habitats through **recovery of damages from natural resource damage claims**.

The Restoration Center maintains strong working relationships in the Great Lakes region with a number of non-profit organizations and governmental entities including the Great Lakes Commission, Ducks Unlimited, The Nature Conservancy, and the National Wildlife Federation. Through these partnerships, the Restoration Center assists with restoration project design and engineering, on-the-ground restoration work, and project evaluation to inform future restoration

efforts.

Currently, NOAA's greatest needs in this area include help with the monitoring of restoration projects both during and after project completion, as well as increased outreach and educational efforts on behalf of restoration work.

The Great Lakes ecosystem has been severely damaged by more than 180 invasive and non-native species. Species such as the **zebra mussel**, **quagga mussel**, **round goby**, **sea lamprey**, and **alewife** reproduce and spread, ultimately degrading habitat, out-competing native species, and short-circuiting food webs. Non-native plants such as **purple loosestrife** and **Eurasian milfoil** have also harmed the Great Lakes ecosystem. Unfortunately, the damage caused by invasive species often goes beyond the ecological. They can threaten human health and hurt the Great Lakes economy by damaging critical industries such as fisheries, agriculture, and tourism.[66]

It is extremely difficult to control the spread of an invasive species once it is established, which makes prevention the most cost-effective approach to dealing with organisms that have not yet entered or become established in the Great Lakes.

Toward this end, the GLRI supports efforts to develop a "comprehensive program for detection and tracking newly identified invasive species in the Great Lakes and providing up-to-date critical information needed by decision makers for evaluating potential rapid response actions."

NOAA is committed to developing models and strategies to combat invasive species in a proactive and cost-effective manner. Thanks to GLRI funds, NOAA and partner agencies have been able to launch and expand several important projects. (NOAA Regional Collaboration)

[66] NOAA Regional Collaboration. "Invasive Species". NOAA. <http://www.regions.noaa.gov/great-lakes/index.php/great_lakes-restoration-initiative/invasive-species/>.

Potential cooperation opportunities between NOAA and restoration

We think the cooperation opportunities between NOAA and restoration partners in the Great Lakes region could:

1) Promote outreach on issues through the use of media such as newsletters, videos, podcasts, etc.
2) Increase public knowledge of ways to lessen pollution in aquatic environments such as lakes and streams
3) Increase monitoring capabilities through volunteers or hired workers
4) Map and identify areas in which restoration work is needed
5) Advocate for increased restoration work to lawmakers, on state and national levels
6) Create programs that incentivize the removal or consumption of invasive species such as Asian Carp
7) Increase forecast capabilities for harmful algal blooms

Case study 1: Restoration of Florida's St. Vincent Island[67]

NOAA recently restored a large area of St. Vincent Island National Wildlife Refuge, a 12,000 acre barrier island in the Gulf of Mexico. Nearly 2,000 acres of wetland needed to be restored as a result of 45 miles of roads blocking natural tidal flow for many years.

These wetlands and the surrounding Apalachicola Bay serve as a nursery for a wide variety of fish species, including striped bass, Gulf sturgeon, tarpon, red drum, spotted seatrout, and Gulf flounder. St. Vincent Island also provides sanctuary for a number of endangered and threatened species. Loggerhead, green, and leatherback sea turtles come ashore to nest on its beaches, and wood storks stop here during their migrations.

NOAA partnered with the FishAmerica Foundation, U.S. Fish and Wildlife Service, U.S. Geological Survey, and surrounding Florida communities to map and identify restoration needs, including removal of the roads. Today, healthy swaths of wetlands stretch across areas once blocked by roads and disrupted by water diversion. Birds and fish are also returning as tidal flow

[67] NOAA Habitat Conservation. "NOAA Wraps Up Large Restoration of Florida's St. Vincent Island". NOAA. <http://www.habitat.noaa.gov/restoration/connection/stvincentss.html>.

returns to normal and water quality improves.

In combination with neighboring restoration efforts at Tates Hell State Forest, St. Joe Bay Buffer Preserve, and Florida Fish and Wildlife Commission's Apalachicola Wildlife and Environmental Area, the St. Vincent Island restoration will ensure that the entire region benefits from this conservation success.

Case Study 2: Asian Carp Incentive[68]

The Illinois Department of Natural Resources (IDNR) teamed up with Sean Keeley, owner and executive chef of Ross Isaac, one of Springfield's most popular restaurants, to raise awareness of how tasty Asian carp can be and build off the success of the IDNR's Target Hunger Now! program. Long-term program partners Feeding Illinois and Illinois American Water joined the IDNR to continue building an understanding of how a vibrant local market for Asian carp contributes to managing the population of this invasive species.

Illinois State Fair visitors were able to sample this healthy, tasty fish free of charge inside Conservation World across from the IDNR Fisheries Tent. Free samples of Asian carp sliders and fritters prepared by Chef Keeley were available between 11 a.m. and noon.

"It's important to show people in Illinois and the Great Lakes region that we have a multi-pronged mitigation plan for controlling the Asian carp population. We had great success at the Taste of Chicago with an Asian carp sampling, and the Illinois State Fair is another great venue to showcase one element of that plan: the presence of a strong local market for Asian carp as a food source," IDNR Director Marc Miller said.

With the help of culinary students from Lincoln Land Community College in Springfield, Chef Keeley prepared smoked Asian carp barbeque sliders and Asian carp fritters for Conservation World visitors to sample. By introducing visitors to Asian carp in a fun, delicious way, the free tasting was intended to increase awareness of work being done to control the invasive fish.

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[68] McCloud, Chris. "Illinois Department of Natural Resources Brings Asian Carp to the Illinois State Fair". Illinois Department of Natural Resources. <https://www.dnr.illinois.gov/news/Pages/IllinoisDepartmentofNaturalResourcesBringsAsianCarptotheIllinoisStateFair.aspx>.

The IDNR is working on a variety of fronts with the Asian Carp Regional Coordinating Committee (ACRCC) to eradicate the threat posed by non-native Asian carp and prevent them from establishing a population in the Great Lakes. In tandem with these efforts, a local taste for Asian carp will help to keep the fish's population in check.

Over the past two and a half years, efforts by the Illinois DNR, through contracts with Illinois commercial fishermen, have removed more than 1 million pounds of bighead and silver Asian carp from the Illinois River.

Currently, the IDNR uses Asian carp with its Target Hunger Now! program, an agency-managed humanitarian effort that processes and distributes the fish to food banks and charitable organizations throughout Illinois. Target Hunger Now! is a partnership between the IDNR, Feeding Illinois and Illinois American Water.

How do we select partners?

When considering restoration partners, we think the following criteria are important:

1. **Mission** focuses on restoration work in the Great Lakes (20% weight)
2. Knowledgeable in **invasive species mitigation and prevention** or **harmful algal bloom reduction** (15%)
3. Expertise in **data collection and research**, including water quality assessments (15%)
4. Capacity to **provide monitoring** (15%)
5. Ability to provide **outreach** and increase **public awareness** of issues like invasive species and habitat restoration (15%)
6. Direct **connections to communities** of influence (10%)
7. **History of success** working with government agencies (5%)
8. Ability to **provide funding** for various projects (5%)

The Healing Our Waters-Great Lakes Coalition

http://www.healthylakes.org/

Category: Invasive Species, Harmful Algal Blooms, Green Infrastructure, Coastal Management

The Healing Our Waters-Great Lakes Coalition consists of more than 145 environmental, conservation, and outdoor recreation organizations; zoos, aquariums, and museums. Formed in 2004, the Healing Our Waters-Great Lakes Coalition is led by the National Wildlife Federation and the National Parks Conservation Association. It works with conservation leaders in states around the Great Lakes region to secure federal funding to restore and protect the lakes.[69]

It's partners in the states of Minnesota, Wisconsin, Illinois, Indiana, Michigan, Ohio, Pennsylvania, and New York are the backbone of restoration advocacy: they visit members of Congress both in Washington, DC and in district offices to talk about the importance of the Great Lakes. These partners also lead tours of restoration sites around the Great Lakes for members of Congress and other restoration partners, showing the progress that has been made and also how much work remains.

Why do we recommend Healing our Waters- Great Lakes Coalition to NOAA? (Partner analysis part)

Mission focuses on restoration work in the Great Lakes (20% weight)

The focus of the coalition is to restore and protect the Great Lakes. The coalition is active in Washington, D.C. and in the Great Lakes states of Minnesota, Wisconsin, Illinois, Indiana, Michigan, Ohio, Pennsylvania, and New York. 20 points.

[69] Healing Our Waters - Great Lakes Coalition. "About the Coalition". <http://www.healthylakes.org/about-the-how-coalition/>.

Knowledgeable in **invasive species mitigation and prevention** or **harmful algal bloom reduction** (15%)

There does not appear to members specifically dedicated to these areas, but some members do work in areas such as water assessments and nutrient runoff. 12 points.

Expertise in **data collection and research**, including water quality assessments (15%)

Members of the coalition perform research and collect data, including schools, zoos, and environmental organizations. 12 points.

Capacity to **provide monitoring** (15%)

Some members of the coalition can provide volunteers to help with clean-up and hands-on projects. 12 points.

Ability to provide **outreach** and increase **public awareness** of issues like invasive species and habitat restoration (15%)

The Coalition maintains an active presence in Washington, D.C. to educate federal public officials about the importance of Great Lakes restoration through events like Great Lakes Days. Partners also lead tours of restoration sites around the Great Lakes for members of Congress and other restoration partners, showing progress of projects. 15 points.

Direct **connections to communities** of influence (10%)

The coalition is comprised of over 145 environmental, conservation, and outdoor recreational organizations, representing millions of people. 10 points.

History of success working with government agencies (5%)

The coalition is made up of more than 145 member organizations, and is led by the National Wildlife Federation and the National Parks Conservation Association. Previous funding partnerships include the Erb Family Foundation, Great Lakes Fisheries Trust, The Frey Foundation, Joyce Foundation, Charles Stewart Mott Foundation, Peter Wege and the Wege Foundation, The Brico Fund, and The Brookby Foundation.

The work of the Coalition helped lead to the creation of the Great Lakes Restoration Initiative (GLRI). Link to regional success stories for each Great Lakes state: http://www.healthylakes.org/successes/restoration-success-stories/

5 points.

Ability to **provide funding** for various projects (5%)

Some members of the coalition may be able to provide funding.

3 points.

Total score: 89

Friends of the St. Clair River

http://scriver.org/

Category: Habitat Restoration, Outreach/Education

The mission of Friends of the St. Clair River is to provide fun, educational experiences that engage the community in the protection of their water resources. Friends of the St. Clair River promotes scientific, volunteer-based water monitoring and watershed stewardship for the restoration and protection of the St. Clair River.[70]

There has been a lot of progress made on restoring the St. Clair River's ten original impairments, but there is still work to be done for the six remaining impairments to be restored. Today, the St. Clair River Bi-National Public Advisory Council (BPAC) oversees the implementation of the St. Clair River Remedial Action Plan. BPAC is a group of highly dedicated volunteers from both sides of the river that hold meetings on a quarterly basis that rotate between Sarnia, Canada and Port Huron, Michigan.

[70] Friends of the St. Clair River. "Our story". <http://scriver.org/our-story/>.

Why do we recommend Friends of the St. Clair River to NOAA? (Partner analysis part)

Mission focuses on restoration work in the Great Lakes (20% weight)

The partner focuses on restoring the St. Clair River. 20 points.

Knowledgeable in **invasive species mitigation and prevention** or **harmful algal bloom reduction** (15%)

Some previous projects, such as the Marysville Living Shoreline project, had aspects involving invasive species control. Most projects seem to focus on restoring habitats and shorelines. 7 points.

Expertise in **data collection and research**, including water quality assessments (15%)

Partner can help collect data through its water monitoring capabilities. 15 points.

Capacity to **provide monitoring** (15%)

The partner uses volunteer-based water monitoring. A council of volunteers from both sides of the river hold meetings on a quarterly basis, the locations of which rotate between Sarnia, Canada and Port Huron, Michigan. Stewards meetings are held monthly. Friends of the St. Clair River should have the capacity to provide monitoring, as long as their volunteer numbers do not drop a lot. 15 points.

Ability to provide **outreach** and increase **public awareness** of issues like invasive species and habitat restoration (15%)

The partner produces newsletters and hosts workshops and events. There are options to get involved my becoming a citizen scientist and helping to measure, monitor, and report on the environment. 15 points.

Direct **connections to communities** of influence (10%)

The local community in the St. Clair River vicinity and volunteers who help with restoration projects. 10 points.

History of success working with government agencies (5%)

The partner has benefitted from GLRI funding. Projects have been completed in Port Huron North, the Upper St. Clair River Shoreline, and Marysville Living Shoreline. Artificial reef habitats for fish have been completed in the St. Clair River near Algonac. Another project, the River Walk Wetlands, is being constructed at the south end of the Blue Water River Walk and will become St. Clair County Park and Recreation's newest county park. 5 points.

Ability to **provide funding** for various projects (5%)

Most likely, funding is limited. Would probably need funding for new projects, with potential sources being GLRI or local city governments. 1 point.

Total score: 88

The Nature Conservancy

http://www.nature.org/ourinitiatives/habitats/oceanscoasts/howwework/noaa-partnership.xml

http://www.habitat.noaa.gov/pdf/restorationworks.pdf

Category: Habitat Restoration, Invasive Species

The Nature Conservancy currently has partnerships with NOAA to restore the health of degraded habitats in ways that benefit marine life, local communities and coastal economies. These projects have helped protect coastal and marine habitat, restore species important to healthy ecosystem function, remove invasive species, create shellfish spawning sanctuaries

and re-establish water flows to estuaries.[71] Potential to expand projects in Great Lakes.

Why do we recommend the Nature Conservancy to NOAA? (Partner analysis part)

Mission focuses on restoration work in the Great Lakes (20% weight)

The Nature Conservancy's restoration work is spread across the United States, so it is not focused exclusively in the Great Lakes. Restoration work in the Great Lakes accounts for a relatively small percentage of the total work. 10 points.

Knowledgeable in **invasive species mitigation and prevention** or **harmful algal bloom reduction** (15%)

The Nature Conservancy is currently working in Western Lake Erie to address harmful algal blooms. The organization is also involved in invasive species work throughout the US. 15 points.

Expertise in **data collection and research**, including water quality assessments (15%)

The Nature Conservancy can provide field-level support in areas like restoration and monitoring. 15 points.

Capacity to **provide monitoring** (15%)

The Nature Conservancy has done previous monitoring work, such as during a 2011 project at the Ottawa National Wildlife Refuge, in which the Nature Conservancy initiated pre and post restoration monitoring. 15 points.

Ability to provide **outreach** and increase **public awareness** of issues like invasive species and habitat restoration (15%)

[71] Nature Conservancy. "About Our Partnership with the NOAA". <https://www.nature.org/ourinitiatives/habitats/oceanscoasts/howwework/noaa-partnership.xml?redirect=https-301>.

The Conservancy publishes scientific reports that range from inventorying Great Lakes islands to studying effectiveness of land protection for aquatic systems. The Nature Works Everywhere program is intended to have teachers, students, and families explore and understand nature around the world, with interactive lesson plans having customization abilities. The conservancy has nature preserves throughout the 50 states, and also hosts volunteer events throughout the country. 12 points.

Direct **connections to communities** of influence (10%)

The organization works with a wide variety of companies, including banks, software companies, and foundations. 10 points.

History of success working with government agencies (5%)

The Nature Conservancy has been a partner of NOAA since 2001, when they entered into a collaboration to restore the health of degraded habitats that benefit biodiversity, local communities, and coastal economies. 5 points.

Ability to **provide funding** for various projects (5%)

Yes. 5 points.

Total score: 90

National Environmental Coalition on Invasive Species

http://www.necis.net/

Category: Invasive Species

The National Environmental Coalition on Invasive Species (NECIS) is a partnership of leading organizations involved in invasive species policy and action. Coalition partners include conservation organizations, environmental advocacy groups, and scientific professional

societies. These partners collectively represent thousands of scientists, policy experts, and advocates dedicated to preventing the introduction of new invasive species and stopping the spread of existing invaders.[72]

NECIS members use a suite of approaches to prevent the introduction and spread of invasive species, including advocacy, research, and education.

Why do we recommend the National Environmental Coalition on Invasive Species to NOAA? (Partner analysis part)

Mission focuses on restoration work in the Great Lakes (20% weight)

The coalition focuses on invasive species and operates on a national level. 10 points.

Knowledgeable in **invasive species mitigation and prevention** or **harmful algal bloom reduction** (15%)

Members of the NECIS conduct independent research into invasive species issues. This research includes documenting priority vectors and pathways by which invasive species are introduced and spread, analysis of the economic and ecological impact of invasions, assessment of tools and approaches for addressing vectors and pathways, and identification of suitable solutions.

A few of the specific issues NECIS members work on:

Live Animal Imports – Closing off these import pathways for invasives by modernizing regulations and promoting policies that would increase risk screening of new species of exotic fish and wildlife

Ballast Water – Ensure maritime shipping does not introduce new aquatic invasive species by strengthening federal regulation and working to identify and implement new solutions to prevent invasion via ballast water discharge and biofouling.

[72] National Environmental Coalition on Invasive Species. “About”. <http://www.necis.net/about/>.

Permanent Separation of Water Basins – Protect Great Lakes from invasion by Asian Carp and other harmful non-natives by securing a permanent separation between the Mississippi River Basin and the Great Lakes

Early Detection & Rapid Response – Development of a national system for early detection of invasive species and rapid response.

Climate Change & Invasives – Connecting the threats of climate change and invasive species so agencies and the public can adapt to climate-related alterations in invasive species risks.

15 points.

Expertise in **data collection and research**, including water quality assessments (15%)

Some members of the coalition have this expertise. 12 points.

Capacity to **provide monitoring** (15%)

Some members of NECIS may be able to provide monitoring support for Great Lakes projects. 12 points.

Ability to provide **outreach** and increase **public awareness** of issues like invasive species and habitat restoration (15%)

NECIS uses media, seminars, and other educational tools and methods. Outreach efforts are intended to educate policy-makers, stakeholders, and the public about new research and new tools available to reduce invasive species risks. The outreach tools are focused on increasing support for policy change by building alliances, highlighting the work of NECIS members, and raising the public profile and importance of invasive species. 15 points.

Direct **connections to communities** of influence (10%)

NECIS has connections to environmental organizations and professional associations focusing on invasive species. The coalition's advocacy efforts includes relationships with government agencies, members of congress, industry stakeholders, and courts. 10 points.

History of success working with government agencies (5%)

Previous partners include:

- National Wildlife Federation
- Environmental Law Institute
- The Ecological Society of America
- The Society for Conservation Biology
- The National Association of Invasive Plant Councils
- The Center for Invasive Species Prevention
- The Nature Conservancy
- The Wildlife Society
- The Natural Areas Association
- The Alliance is the oldest Great Lakes

5 points.

Ability to **provide funding** for various projects (5%)

Some coalition members may be able to contribute funding. 3 points.

Total score: 82

Marine Aquarium Societies of North America

http://masna.org/aboutus/

Category: Invasive Species, Outreach

MASNA is a non-profit organization composed of marine aquarium clubs, individual hobbyists, and industry partners from North America and abroad, totaling several thousand individuals.

MASNA's Goals are to:

- **Educate** members with online and published material, the MACNA conference, and other sanctioned events
- **Assist** in forming and promoting the growth of clubs within the hobby while ensuring a sustainable future for the marine environment
- **Support** the efforts to eliminate abuses in collecting and transporting marine organisms through education, assistance and encouragement
- **Encourage** the ethical growth of the marine aquarium hobby and support captive breeding/propagation efforts

Why do we recommend Marine Aquarium Societies of North America to NOAA? (Partner analysis part)

Mission focuses on restoration work in the Great Lakes (20% weight)
MASNA focuses on aquariums through North America. 5 points.

Knowledgeable in **invasive species mitigation and prevention** or **harmful algal bloom reduction** (15%)
There is potential to work with MASNA's industry partners that are involved in the aquarium trade. The aquarium trade is a big avenue for invasive species so partnerships with aquarium societies such as MASNA could be useful. Talk to aquarium industry partners about good ways to get rid of fish if they don't want them anymore, rather than just dumping them into a lake. 15 points.

Expertise in **data collection and research**, including water quality assessments (15%)
MASNA members use the latest peer reviewed science to support their position and educational documents. Members are generally aware of how to keep aquatic organisms healthy by providing proper water quality, feeding schedule, treatments, and environments. 10 points.

Capacity to **provide monitoring** (15%)
MASNA doesn't seem to work in this area. 0 points.

Ability to provide **outreach** and increase **public awareness** of issues like invasive species and habitat restoration (15%)
MASNA provides access to a speaker database, an annual conference (MACNA), a collective voice in national and international initiatives, and resources for conservation related activities and information. 11 points.

Direct **connections to communities** of influence (10%)
MASNA provides its members (and could potentially also provide NOAA through a collaboration) links and partnerships with funding and conservation organizations, and breeding and aquaculture facilities and organizations. 10 points.

History of success working with government agencies (5%)
Previous sponsors include EcoTech Marine, Reed Mariculture, Premium Aquatics, Red Sea Fish, asap aquarium.
3 points.

Ability to **provide funding** for various projects (5%)
MASNA offers scholarship funds to students and for publishing research as open access articles. 3 points.

Total score: 57

Conservation associations

Background:

Although the Great Lakes face many challenges, the region is fortunate to have thousands of acres of coastal and wetland habitat that possess exceptional ecological, historical, and recreational value. Several of these land areas have been protected for decades—among them Sleeping Bear Dunes National Seashore, Porcupine Mountains State Park, Superior National Forest, and many others. With GLRI funds, NOAA is continuing to preserve and protect important habitat in the Great Lakes.

NOAA's **Coastal and Estuarine Land Conservation Program (CELCP)** seeks to preserve extraordinary habitat that faces development, contamination, or other threats. CELCP is a competitive grants process that provides state and local governments with matching funds to purchase significant coastal and estuarine lands, or conservation easements on such lands, from willing sellers. Lands or conservation easements acquired through CELCP are protected in perpetuity so that they may be enjoyed by future generations. The impact has been great: since 2002, over **75,000** acres of coastal habitat across the United States has been conserved, including more than 7,500 acres of Great Lakes coastal habitat.

NOAA's Office for Coastal Manage-ment (OCM) is using GRLI funds to support competitively-selected land acquisition projects that are "ready and eligible" for funding in Great Lakes Areas of Concern (AOCs). This competition will provide for the permanent protection of wetlands and other important coastal habitat. An AOC-focused land acquisition competition provides the first step of establishing a pipeline of restoration projects for GLRI funding. EPA and NOAA's other AOC-focused solicitations would provide both restoration planning, design and implementation funds to complete the pipeline of restoration projects contributing toward delisting habitat related beneficial use impairments.[73]

[73] NOAA Regional Collaboration. "Coastal Land Conservation in the Great Lakes". <http://www.regions.noaa.gov/great-lakes/index.php/great_lakes-restoration-initiative/habitats/coastal-land-conservation-in-the-great-lake/>.

Potential cooperation opportunities between NOAA and conservation associations

We think the cooperation opportunities between NOAA and conservation association partners in the Great Lakes region could:

1) Increase outreach to local communities on conservation rights
2) Provide funding to protect important coastal habitat
3) Reintroduce fish and wildlife to coastal habitats
4) Perform research and increase understanding of habitat needs of species in coastal areas
5) Increase collaboration between landowners on issues relating to conservation
6) Provide monitoring and mapping assistance, as well as ecological assessments

Case study: Saginaw Bay Watershed Conservation[74]

The Saginaw Bay Watershed Conservation Partnership has been selected to receive $10 million in funding under the new **Regional Conservation Partnership Program (RCPP)**, which was created under the 2014 Farm Bill. This work, co-led by the **Michigan Agri-Business Association** and **The Nature Conservancy**, represents a unique collaboration between conservation organizations, agronomy retailers, higher education institutions, commodity groups, agribusinesses and state and federal agencies.

This project, through the **generous support of 16 sponsors**, consists of over **30 partner organizations** and is designed to direct Farm Bill dollars to the most optimal locations in the watershed – with the ability to track and measure progress against watershed goals. We aim to train approximately 100 certified crop advisors (CCA) from seven companies to use the **Great Lakes Watershed Management System** in order to help their customers, farmers across the watershed, implement practices designed to reduce nutrient loads and recharge groundwater.

[74] Conservation Gateway. “Saginaw Bay Regional Conservation Partnership Program.” The Nature Conservancy. <http://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/michigan/projects/Pages/Regional-Conservation-Partnership-Program.aspx>.

This project employs **three major innovative strategies**:

First, we are utilizing precision conservation: setting meaningful goals for the use of agricultural best management practices based on **how many acres are necessary to affect a change in water quality**.

Second, we are partnering with agribusinesses to equip them with the science and tools to help their customers, farmers across the watershed, implement practices designed to reduce sediment and nutrient loads and recharge groundwater.

Third, we are using online tools developed in partnership with Michigan State University's Institute of Water Research to target acres with the highest potential for ecological returns and to track progress toward watershed goals. (Conservation Gateway)

How do we select partners?

When considering conservation association partners, we think the following criteria are important:

1. **Mission** conservation-related and advocates for local communities (20% weight)
2. Direct **connections to communities** of influence (20%)
3. **History of success** in communicating with large number of organizations (15%)
4. Ability and willingness to help **preserve habitat** in danger from development, contamination, and other threats (15%)
5. **Outreach/educational program** for promoting important issues (10%)
6. Ability to **provide support** in conservation field activities (ecosystem assessments, monitoring, GIS, etc) (10%)
7. **History of success** in partnerships with government agencies (10%)

The Association of Illinois Soil and Water Conservation Districts (AISWCD)

http://www.aiswcd.org/about-aiswcd/

The Association of Illinois Soil and Water Conservation Districts (AISWCD), is a grass roots organization formed in 1948. It is made up and serves Illinois' 98 member Soil and Water Conservation Districts (SWCDs). The AISWCD's board members are representatives from local SWCD's. Each local District is governed by an elected five member board. Members of each local board represent their district at the Land Use Council (LUC) level. Each of the 16 Councils elects one Director to the voting body of the AISWCD Board of Directors.[75]

Why do we recommend AISWCD to NOAA? (Partner analysis part)

Mission conservation-related and advocates for local communities (20% weight)
Mission is to represent and empower Illinois' Soil and Water Conservation Districts. 20 points.

Direct **connections to communities** of influence (20%)
The partner is made up of 98 member SWCDs in Illinois, with representatives from local SWCDs serving as board members. 20 points.

History of success in communicating with large number of organizations (15%)
AISWCD has quarterly board meetings and larger annual meetings, in which major issues are discussed. 15 points.

Ability and willingness to help **preserve habitat** in danger from development, contamination, and other threats (15%)
AISWCD has shown concerns about issues such as the causes of hypoxia, nutrient reduction strategies, and about having clean and usable water for all living creatures. 10 points.

[75] Association of Illinois Soil & Water Conservation Districts. "About AISWCD". <http://www.aiswcd.org/about-aiswcd/>.

Outreach/educational program for promoting important issues (10%)

AISWCD releases a newsletter every month, called the Conservation Catchall, that brings to attention upcoming events, such as Legislative Day and Earth Day, educational events, and volunteering opportunities. The newsletter also provides conservation tips, such as how to conserve water. 5 points.

Ability to **provide support** in conservation field activities (ecosystem assessments, monitoring, GIS, etc) (10%)

The individual conservation districts can help with conserving and restoring wetlands, monitoring work, planting trees and other land cover, and reaching out to communities and schools to teach the value of conservation efforts. 8 points.

History of success in partnerships with government agencies (10%)

The partner has worked with federal and state organizations, including the USDA Natural Resources Conservation Service, US Department of Agriculture, US Environmental Protection Agency, and US Army Corp of Engineers. 10 points.

Total score: 88

Wisconsin Land and Water Conservation Association

http://wisconsinlandwater.org/about/who-we-are

The Wisconsin Land and Water Conservation Association (WI Land+Water) is a 501 (c) 3 non-profit, membership organization that supports the efforts of 450 Land Conservation Committee (LCC) supervisors and 350 conservation staff in 72 county Land Conservation Department (LCD) offices. WI Land+Water provides training, develops conservation standards, promotes youth education, issue grants, builds partnerships, and provides advocacy for members.[76]

Why do we recommend WI Land+Water to NOAA? (Partner analysis part)

Mission conservation-related and advocates for local communities (20% weight)
Wisconsin Land+Water's mission is to support the county land conservation committees and land conservation department offices to help landowners and users meet their objectives while protecting land and natural resources. 20 points.

Direct **connections to communities** of influence (20%)
The Association supports efforts of 450 Land Conservation Committee supervisors and 350 conservation staff in 72 county Lake Conservation Departments in Wisconsin. 20 points.

History of success in communicating with large number of organizations (15%)
Has worked with a large number of committees and department offices throughout the state. 15 points.

Ability and willingness to help **preserve habitat** in danger from development, contamination, and other threats (15%)
Places importance on conserving and maintaining the state's limited land base and soil productivity, as well as its lakes, streams, and groundwater. 12 points.

[76] Wisconsin Land+Water. "Who We Are". <http://wisconsinlandwater.org/about/who-we-are>.

Outreach/educational program for promoting important issues (10%)

Wisconsin Land+Water has a Youth Education Committee that develops and maintains programs for Wisconsin's youth. The following programs are currently being focused on:

- Conservation Awareness Poster and Speaking Contest
- Wisconsin Envirothon – Combined efforts of educators and natural resource professionals to provide hands-on, outdoor coaching and testing areas such as soils, aquatic, forestry, and wildlife
- Youth Conservation Camps – Provide outdoor educational experiences and introduce careers in conservation and natural resources. Professionals from various agencies come present programs.

The Food, Land & Water Project lets Wisconsin stakeholders talk about the state's food, land and water resources, and four main talking points are surface water quality, groundwater quality, groundwater quality, and the future of Wisconsin working lands.

Wisconsin Land+Water gives out awards for conservation accomplishments, including Conservation Farmer of the Year and Conservation Steward. 10 points.

Ability to **provide support** in conservation field activities (ecosystem assessments, monitoring, GIS, etc) (10%)

The partner facilitates two collaborative grounds that engage in the technical aspects of conservation practices. The Technical Committee, which consists of several Land Conservation Department staff, addresses issues with conservation practices such as conservation planning, inventory and evaluation tools, technical certification, and conservation practice and design implementation. The Standards Oversight Council is a collaboration of conservation agencies that oversees a team approach in developing and maintaining technical standards for soil and water conservation practices in Wisconsin. 8 points.

History of success in partnerships with government agencies (10%)

Previous partners include Wisconsin Department of Agriculture, Consumer Protection, and

Trade and the Wisconsin Department of Natural Resources. 10 points.

Total score: 95

Wildlife Forever

http://www.wildlifeforever.org/

Category: Invasive Species, Outreach/Education

Wildlife Forever is an American all-species conservation charity. Grassroots conservation projects fall into four categories:

- Fish and Wildlife Management – Species reintroductions that bring fish and wildlife back to places they were once found
- Habitat – Millions of acres of wetlands and habitat are conserved across 34 states with help of Wildlife Forever members and donors.
- Education – Educating public about invasive species and recruiting others to help prevent their spread. Conservation education programs for children include the State-Fish Art Contest, the *Critter Books* pocket guide series and a 14 lesson CD-ROM Curriculum.
- Research – Efforts to better understand complexities of fish and wildlife.

In previous project with USFWS, Wildlife Forever helped with outreach and education to boaters, anglers, and watercraft users of the Great Lakes on invasive species awareness and prevention.[77]

[77] Wildlife Forever. “ABOUT Wildlife Forever”. <http://www.wildlifeforever.org/about/>.

Why do we recommend Wildlife Forever to NOAA? (Partner analysis part)

Mission conservation-related and advocates for local communities (20% weight)

The mission of Wildlife Forever is to conserve America's wildlife heritage through conservation education, preservation of habitat and management of fish and wildlife. 14 points.

Direct **connections to communities** of influence (20%)

Wildlife Forever has conservation projects in every US state. 15 points.

History of success in communicating with large number of organizations (15%)

Previous partnership successes have included acquisition of land for public recreation, construction and placement of nesting structures, research utilizing radio telemetry and GPS for large mammals, stream improvement and riparian repair, fish hatchery support, and natural resource and habitat conservation education for hunters, anglers, and youth. 12 points.

Ability and willingness to help **preserve habitat** in danger from development, contamination, and other threats (15%)

Previous successes have included saving bear and salmon habitat from development, restoring wetlands in Wisconsin, and improving public land that helped turkeys. 15 points.

Outreach/educational program for promoting important issues (10%)

Conservation programs for children include the State-Fish Art Contest, the CD-ROM 14 Lesson Curriculum, and the Critter Book Pocket Guide Series. For adults, the Threat Campaign is a series of multimedia outreach materials (television, print ads, billboards, airport dioramas, DVDs, and PSAs) targeting anglers, boaters, hunters and recreational users to stop the spread of invasive species. 10 points.

Ability to **provide support** in conservation field activities (ecosystem assessments, monitoring, GIS, etc) (10%)

Wildlife Forever provides funding to projects. Projects funded in the Great Lakes include wetland restoration, habitat protection, investigations into species decline, conservation

education, and adding acres to public lands. 10 points.

History of success in partnerships with government agencies (10%)
Partners include US Forest Service and US Fish and Wildlife. Wildlife Forever has received conservation awards, such as in Conservation Leadership (2015) from Bureau of Land Management & U.S. Forest Service. 10 points.

Total score: 86

Tip of the Mitt

https://www.watershedcouncil.org/our-work.html

Category: Information producer, Coastal Health, Coastal Management, Habitat Restoration, Advocacy, Outreach/Education

Goal is to protect Northern Michigan lakes, streams, wetlands, and groundwater through respected advocacy, innovative education, technically sound water quality monitoring, and thorough research and restoration actions. Activities: developing watershed management plans, conducting aquatic inventories, surveys, and GIS services, coordinating and conducting monitoring programs, policy and advocacy efforts, initiating and coordinating restoration projects, education and outreach efforts.[78]

Why do we recommend Tip of the Mitt to NOAA? (Partner analysis part)

Mission conservation-related and advocates for local communities (20% weight)
The Tip of the Mitt Watershed Council represents Northern Michigan's waters. The organization is dedicated to protecting lakes, streams, wetlands, and groundwater through respected advocacy, innovative education, technically sound water quality monitoring, thorough research

[78] Tip of the Mitt. “Our Work”. <https://www.watershedcouncil.org/our-work.html>.

and restoration actions. 20 points.

Direct **connections to communities** of influence (20%)
Tip of the Mitt is the lead organization for water resources protection in Antrim, Charlevoix, Cheboygan, and Emmet Counties, and the council speaks for full-time and seasonal residents, lake associations, and businesses. 18 points.

Water resources in service area include:

- More than 2,500 miles of rivers and streams
- Multiple blue-ribbon trout streams
- 14 lakes larger than 1,000 acres (among the largest in the State)
- 38 lakes between 100 - 1,000 acres
- 184 lakes between 10 - 100 acres
- 1,600 lakes that are less than 10 acres
- 363,998 acres of wetlands (according to 2006 Landcover Statistics)

History of success in communicating with large number of organizations (15%)
Tip of the Mitt has many members and supporters, and has entered into partnerships which helped initiate a few of its projects. 15 points.

Ability and willingness to help **preserve habitat** in danger from development, contamination, and other threats (15%)
The organization works in monitoring, policy and advocacy, restoration, and invasive species. 15 points.

Outreach/educational program for promoting important issues (10%)
The Watershed Academy gives high school biology students opportunities to learn about their watershed and present their findings at the Watershed Academy Summit. Tip of the Mitt hosts activities such as shoreline recognition program, rain garden initiative, and invasive species workshop. 9 points.

Ability to **provide support** in conservation field activities (ecosystem assessments, monitoring, GIS, etc) (10%)

- Development of water management plans
- Inventories and surveys (aquatic plant surveys, river road stream crossing inventories, lake and stream shoreline surveys, mapping and natural resource inventories)
- Monitoring programs – Council has worked with local residents and volunteers have helped to monitor lakes and streams.
- Shoreline Restoration Projects – Council can provide different levels of contract services
- Avian botulism monitoring – volunteers can help remove dead birds and fish

10 points.

History of success in partnerships with government agencies (10%)

Michigan DEQ

Michigan Natural Shoreline Partnership

10 points.

Total score: 97

Heart of the Lakes

http://www.heartofthelakes.org/

Category: Outreach, Advocacy

Pursues services such as conservation support, communications and outreach, policy & advocacy, sustainability and effectiveness.[79]

[79] Heart of the Lakes. <http://www.heartofthelakes.org/>.

Why do we recommend Heart of the Lakes to NOAA? (Partner analysis part)

Mission conservation-related and advocates for local communities (20% weight)
Heart of the Lakes strengthens the collective efforts of organizations dedicated to the conservation of Michigan's environmentally and economically significant land and water. The organization seeks to provide leadership, innovative ideas, and advocate for smart public policy for the benefit of communities and generations to come. 20 points.

Direct **connections to communities** of influence (20%)
The partner has connections to 24 land conservancies in Michigan, and 6 members with statewide service areas. 20 points.

History of success in communicating with large number of organizations (15%)
The land conservancy community can communicate through Heart of the Lakes. Heart of the Lakes keeps member land conservancies informed about policy issues and opportunities to engage in policy matters. 15 points.

Ability and willingness to help **preserve habitat** in danger from development, contamination, and other threats (15%)
Heart of the Lakes engages in policy and advocacy to help conserve natural resources that benefit people in Michigan. 10 points.

Outreach/educational program for promoting important issues (10%)
Hosts events and summits, workshops and retreats. 7 points.

Ability to **provide support** in conservation field activities (ecosystem assessments, monitoring, GIS, etc) (10%)
The Advancing Conservancy Excellent (ACE) program provides technical training seminars and conservancy collaborations to Michigan land conservancies. Conservancy Clearinghouse contains documents, sample policies and other materials on land protection, organizational development, and legal issues for conservation. 7 points.

History of success in partnerships with government agencies (10%)

Land Trust Alliance (ACE program), Michigan Department of Agriculture, Michigan Department of Natural Resources, US Department of Agriculture (Natural Resource Conservation Service)

9 points

Total score: 88

Great Lakes Indian Fish & Wildlife Commission (GLIFWC)

http://www.glifwc.org/

Category: Coastal Health, Coastal Management, Invasive Species

GLIFWC represents eleven Ojibwe tribes in Minnesota, Wisconsin and Michigan who reserved hunting, fishing, and gathering rights in the 1837, 1842, and 1854 Treaties with the U.S. Government. GLIFWC provides natural resource management expertise, conservation enforcement, legal and policy analysis, and public information services in support of the exercise of treaty rights during well-regulated, off-reservation seasons throughout the treaty ceded territories.[80]

Related focus areas include conservation enforcement, fisheries, measurement of lake mercury levels, and invasive species management.

Why do we recommend GLIFWC to NOAA? (Partner analysis part)

Mission conservation-related and advocates for local communities (20% weight)

- GLIFWC is committed to the implementation of its members' off-reservation treaty rights to fish, hunt and gather in the ceded territories.

[80] Great Lakes Indian Fish & Wildlife Commission. "About". <http://www.glifwc.org/>.

- GLIFWC is committed to the preservation and enhancement of the natural resources so harvest opportunities will be available for generations to come.
- GLIFWC strives to infuse Ojibwe culture and values into all aspects of its work.

18 points.

Direct **connections to communities** of influence (20%)

GLIFWC represents **eleven Ojibwe tribes** in Minnesota, Wisconsin, and Michigan.

15 points.

History of success in communicating with large number of organizations (15%)

Yes. 15 points.

Ability and willingness to help **preserve habitat** in danger from development, contamination, and other threats (15%)

Organization enforces conservation measures, works in projects relating to contamination, and protects against invasive species. 15 points.

Outreach/educational program for promoting important issues (10%)

Partner offers an online boater safety course as well as a youth summer camp. 6 points.

Ability to **provide support** in conservation field activities (ecosystem assessments, monitoring, GIS, etc) (10%)

- Conservation enforcement
- GIS and mapping
- Mercury Consumption Advisories and maps
- Projects relating to chemical contamination of fish, wildlife, and environment of territories
- Fish harvest monitoring
- Controlling invasive sea lamprey
- Assessments of key ecosystem fish such as whitefish, lake trout, and lake sturgeon

10 points.

History of success in partnerships with government agencies (10%)

US Environmental Protection Agency

10 points.

Total score: 89

Conservation Resource Alliance

http://www.rivercare.org/about-cra

Conservation Resource Alliance (CRA) is a private, not-for-profit corporation committed to "sensible stewardship of the land." Established in 1968 as part of a nationwide network of Resource Conservation and Development Councils, the organization serves northwest lower Michigan. Staffed with wildlife biologists, fisheries biologists, engineers and field technicians, CRA works with landowners to plan, locate funding options, cut through red tape, and implement programs to enhance the habitat value and beauty of the region.[81]

CRA is known for its collaborative land-use solutions among private landowners, government agencies and commercial businesses. The intent of CRA is not to litigate to prevent development, but to foster locally-driven solutions that will preserve or develop land in a positive manner for all parties involved. Instead of promoting further regulations or lawsuits, our aim is to foster partnerships in order to understand consequences, alter behavior, and create win-win cooperative efforts.

CRA's RiverCare Program is an example of a program aimed at reaching specific regional stewardship goals. The RiverCare Program was created to guarantee that natural resource professionals maintain a consistent and prioritized action plan for each river in CRA's region, find and repair physical problems before they become worse, and maintain efficient, coordinated

[81] Conservation Resource Alliance. “About CRA”. <http://www.rivercare.org/about-cra>.

local river committees of agency, resident and interest group representatives.

Why do we recommend Conservation Resource Alliance to NOAA? (Partner analysis part)

Mission conservation-related and advocates for local communities (20% weight)
CRA is dedicated to stewardship of the land and serves northwest lower Michigan.

Direct **connections to communities** of influence (20%)
CRA connects interest groups, landowners, developers and government agencies who have interest in and who can help with clean water and healthy watersheds. 20 points.

History of success in communicating with large number of organizations (15%)
CRA serves northwest Lower Michigan. 20 points.

Ability and willingness to help **preserve habitat** in danger from development, contamination, and other threats (15%)
Yes. 10 points.

Outreach/educational program for promoting important issues (10%)
The River Care Kids program works with young people to encourage interest in watersheds.

7 points.

Ability to **provide support** in conservation field activities (ecosystem assessments, monitoring, GIS, etc) (10%)
The River Care Program maintains a consistent and prioritized action plan for each river, finds and repairs physical problems before they become worse, and maintains efficient and coordinated local watershed partnerships. The program is designed to maintain the aesthetic and economic value of northern Michigan streams.

The WildLink Program assists volunteer landowners in managing private property corridors used by wildlife for travel. The program assists landowners in outlining a five to ten-year voluntary program for developing or modifying land use in order to keep wildlife corridors open for animal movement.

10 points.

History of success in partnerships with government agencies (10%)
Previous partners include the Great Lakes Commission, Michigan Department of Transportation, Michigan DNR, USDA Rural Development, US EPA, US Fish & Wildlife Service

Total score: 92

Land Trust Alliance

https://www.landtrustalliance.org/

Category: Information distributor, Advocacy

The Alliance brings its more than 1,100 member land trusts together — and increases each one's success. We advocate for the policies and incentives that it takes to save millions of acres every year. We're the go-to source for training for people who work in conservation — so land trusts get more done. We back up land trusts when the places they promise to protect are threatened. And we support land trusts in connecting more people to the land.[82]

[82] Land Trust Alliance. "what we do". <https://www.landtrustalliance.org/what-we-do>.

Why do we recommend Land Trust Alliance to NOAA? (Partner analysis part)

Mission conservation-related and advocates for local communities (20% weight)
The Land Trust Alliance works to save places that people need by strengthening land conservation across America. Education programs improve and empower land trusts, and the organization is always looking for new partners, programs, and priorities. 15 points.

Direct **connections to communities** of influence (20%)
Partner represents more than 1000 member land trusts supported by more than five million members nationwide. The Midwest regional program represents 165 local and regional land trusts across the states of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Ohio, Oklahoma, Nebraska, North Dakota, South Dakota, and Wisconsin. The Great Lakes watershed is served by 105 land trusts. These land trusts partner with landowners, communities, government agencies, and each other to help protect the watershed. 20 points.

History of success in communicating with large number of organizations (15%)
Has previously worked with a large number of land trusts. 15 points.

Ability and willingness to help **preserve habitat** in danger from development, contamination, and other threats (15%)
Yes. 10 points.

Outreach/educational program for promoting important issues (10%)
Saving Land, a magazine written by and for land conservationists that is available quarterly to Land Trust Alliance members and partners. The 42-page color magazine offers stories, tips and resources on the latest trends in land conservation. 6 points.

Ability to **provide support** in conservation field activities (ecosystem assessments, monitoring, GIS, etc) (10%)
Partner offers services such as land trust advancement programs (in Indiana, Michigan, and

Wisconsin), mentoring, assessments, resources (case studies, reports and guides), grants, training, and regional conferences to focus on Midwest issues. 8 points.

History of success in partnerships with government agencies (10%)
Department of Defense

Corporate partners: Bartlett Tree Experts, Dow Chemical Company, Esri, ExxonMobil, Pacific Gas and Electric Company

8 points.

Total score: 82

V. Conclusions and recommendations to NOAA

After completing our evaluation of the prospective partners on our list, we have ordered partners from highest to lowest based on their overall score. We recommend all organizations on this list, because they all in some way provides something NOAA needs in a partnership. Those organizations with higher scores may be able to provide more in terms of what NOAA needs in a particular category. Because at least some portions of our methods are subjective in terms of how much we may value a particular criteria for a partnership, we have provided analysis of each organization, to better inform the reader about an organization's ability to work well as a partner with NOAA.

By partner category, here is a list of potential partner organization scores in descending order:

Industries

Council of Great Lakes Industries - 93/100

United States Business Council for Sustainable Development - 90/100

Great Lakes Captains Association - 86/100

Great Lakes Boating Federation - 83/100

Foundations

Fund for Lake Michigan - 98/100

Fred A. and Barbara M. Erb Family Foundation - 96/100

Frey Foundation - 87/100

Brico Fund - 76/100

Coastal Management

Center for Neighborhood Technology - 92/100

Milwaukee Metropolitan Sewerage District - 88/100

Great Lakes Beach Association - 83/100

Great Lakes Surf Rescue Project - 51/100

Education

Michigan Association of School Boards - 90/100

Great Lakes Aquarium - 88/100

Michigan Association of Nonpublic Schools - 88/100

Project Grow - 73/100

Restoration

Nature Conservancy - 90/100

Healing our Waters - Great Lakes Coalition - 88/100

Friends of the St. Clair River - 88/100

National Environmental Coalition on Invasive Species - 82/100

Marine Aquarium Societies of North America - 57/100

Conservation

Tip of the Mitt - 97/100

Wisconsin Land and Water Conservation Association - 95/100

Conservation Resource Alliance - 92/100

The Association of Illinois Soil and Water Conservation Districts - 88/100

Heart of the Lakes - 88/100

Wildlife Forever - 86/100

Great Lakes Indian Fish & Wildlife Commission - 89/100

Land Trust Alliance - 82/100

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Appendix A: Interviews

Ed Rutherford Interview

I1: Jerry

12: Young
M: Ed Rutherford

I1: So the kinds of partnerships we're looking at are for ones with NOAA and private organizations. Maybe a good example is with Thunder Bay national sanctuary, in which NOAA partnered with a glass bottom boating company there to – where each organization was able to provide something to the partnership. Each one was able to benefit, each one was able to benefit, NOAA was able to get additional educational outreach and get more data. The company was able to generate more publicity and able to get more people to use its services. Somewhere where both NOAA and the private company is able to benefit from a partnership.

M: Yeah, so I'm thinking about it a little bit. I talked to Jennifer about it for a little bit, trying to get more information. One thing that we're involved with is, a couple of things related to invasive species. One is this information system, GLANSIS. And it's where you can find out information about invasive species that are in the Great Lakes or ones that are likely to come into the Great Lakes, and what's the threat. We're trying to work on proving the predictions of where they – if the ones that are not here yet, where would they go and where would they have the most effect?

I1: So is Asian carp a few years a good example?

M: Yeah, that's a perfect example. Or snakehead, or silver shrimp, there's a long list. Having information from – I can think about individuals, helping to sort of be on the lookout for records for species when they see it. Anglers are often – they're very observant and they're all over the Great Lakes, you know. They catch things. That happens to some degree, but I don't know how well that happens. That's a possibility. The other thing is that this is more citizen science, project to .. technology for environmental DNA now. You can take … one of the faculty candidates for aquatic ecology is talking about – she does work in environmental DNA and is talking about taking samples from water and detect new species. That's certainly something that could be done. We don't do that in our lab, but certainly another group for university partnership could work. We do projections of where species will go, and what effect they have. So having

information from groups of anglers about that … Some of our scientists report regularly to fisheries groups each year – Sea Grant, there's a Sea Grant extension workshop on Lake Huron and Lake Michigan. And I actually talked to them before about invasive species, ones that might come in, but there's nothing formal set up with them.

I1: So that might be a potential partnership for new partnerships?

M: Yeah, there's several different clubs, Michigan United Conservation Club, Travel Unlimited are 2 that come to mind that might be useful. What else? There's other ways that invasives get in the Great Lakes and right now, the aquarium trade is a big deal. It's a big avenue for invasive species so partnerships with aquarium societies could actually be really good. Talk to them about what are good ways to get rid of fish if you don't want them anymore, rather than just dumping them into a lake. And that's something we could talk to them about. What species are getting in through these various mechanisms, either bait trade or aquarium trade.

I1: So are the aquarium trade companies involved mainly local to Great Lakes, or …?

M: Well, I know there's, in Ann Arbor, Aquarius Society, but there's different clubs that individuals are interested in setting up aquariums. There's also businesses that run. So I don't know how you would set that up, the best way to do it, but it would be an important way to stop the flow of invasives in the Great Lakes. There's not a lot of other things, there's stuff I know that different government agencies do - EPA, USVS, in terms of research and management. But then having private concerns involved. I mean, if you have some thoughts too, I would be glad to hear them and I could comment on them.

[00h07m11s]

I2: So you mentioned the fisheries trade, so we think the partnership can be 2 directions. One direction is we can provide information to fisheries, they can use information to predict invasive species. Also, fisheries can also help us to do some monitoring or sample collection, to help us to predict or to input information into our data space.

M: Yeah, so I used to work on several of the tributaries in the Great Lakes when I was here as a research person. I thought I could get help from guide fisherman to collect samples of fish and give me scales so I could understand how old the fish were. It's a good idea and hopefully it will work. They're in the business of getting somebody out to catch the fish, so doing something else is hard to do reliably. It may be better idea to see if they could allow somebody to come onboard with them when they do so they don't have to spend time doing something. But I think it's a good idea.

I1: Just have a specialist come along to these expeditions to gather data, and have the fishing guides do their own thing?

M: Yeah

I2: Yeah, maybe we can provide some incentive for that.

M: Yeah, or provide some funding for them. In commercial fisheries, they often collect some stuff, if they see it they may report it or they may not. It may be worth working with them. Let's see, another thing, getting additional measurements of temperature in habitats, and water like in streams, lakes would be really useful. For predicting what would be able to live. There's often just a model temperature based on the size of the lakes and latitudes, and then also there's a prediction where spring and fall turnover occur. But really, we need a lot more data. So having that additional data would be really helpful.

I1: Would citizen science be a viable option?

M: Yeah, so people are collecting a lot of data, or are encouraged to collect information on trees coming into bloom, or when flowers are blooming, when bees are coming out. In the same way as collecting temperature records. In lake associations, they really care about their own particular lakes. They might be more willing to do that than not.

I1: So an association for Lake Huron would be able to encourage people in that area to collect more data?

M: For invasive species, sometimes they're brought in on somebody's boat and the boat goes into an inland lake or river and gets to a Great Lake from there. Having information about temperatures of inland lakes and streams, since a lot of those are not monitored, but they're visited, they're used, and the boats go elsewhere. And temperature data can be instruments that are fairly inexpensive that can be used to do that. Aquatic plants are a big – if you looked at all the invasive species in the great lakes or projected to come in, aquatic plants are one of the biggest groups, and a lot of those are coming in through the aquarium trade. Trying to make people learn what the plants are and be on the watch would be great.

I1: Yeah, so I read that NOAA currently does have a bit of an educational/outreach for the program. How do you feel they could better expand that program to better serve the public?

M: We're working on improving the website, which is pretty bad right now, pretty hard to search. But not everybody goes to the web to look for invasive species, so I think having more – we've got a really good person, Rochelle Sturtevant, who can tell people about different invasives, but you have to take the next step to walk to watershed groups, watershed councils, lake associations, and follow up. And I don't think that happens right now.

I1: What do you think the main issue in not following up might be?

M: Just time. Time and effort. So it'll be good to look at the structure of who's in the state. Typically, in our lab, there's 3 or 4 people that deal with invasive species. I work on models that predict what effect they are having, and the ecology side of that. The outreach on prevention is handled by Rochelle Sturtevant, and that's really just 1 person in our lab. And if you do to other labs, government labs, it's the same deal. It'll be worth looking at the state level and seeing how many people are involved in that. It'll maybe be the case you can train somebody in a lake association or conservation group to really work on invasive species identification and monitoring.

I2: What's the main source of the invasive species to Great Lakes region?

M: They used to mainly come from shipping ballasts from Europe. From the Caspian Sea region to northern Europe to Sweden, Norway, to England and then all over. But that route has been – ships are now required to flush their ballasts before they get into the Great Lakes. If they do that, it usually kills 95% of the organisms that would be in there that would be adapted to freshwater. So now most of the organisms coming in are coming through canals or aquarium business. And then the next level is bait buckets. So the aquarium trade and the canals are – people are aware organisms get in through there, and they're trying to deal with it slowly. And the internet market for fish – like I mentored a student that graduated from here, he used to trade fish from the internet. Solomon David, he's an expert in gar fish, and very primitive fish. If you go to primitivefishes.org. At one time he had all fish, all gars in the world in his living room, he's feeding them. He's smart enough to not just release them in local lake. It means anyone else could do it, and they probably don't have the same concern.

I1: So there's not a whole lot of regulation on the trading of these fish.

M: No. I think that – think about what would be the most effective thing to do. Working on preventing them from coming in the first place, and that means outreach to businesses and to groups that share those interests.

I1: For the outreach, what do you think the main message should be?

M: Just that, enjoy the organisms you're bringing in, but don't release them. When you are ready to be done with them, destroy them. These are the ones we think are most harmful, so please don't bring them in. We have a list that's being updated all the time. And also to learn about them, the ecology of these species, what's their impact on the Great Lakes, because that information is available out there. There are traits that are highly invasive, and more education about that would be really good.

I1: More education to be able to help identify each species?

M: Yeah, especially for stuff like plants that people are bringing in. I know I'm pretty bad at plant identification, not everyone is. There are smaller organisms too, like zooplankton. We just found a new species of zooplankton in Lake Erie that's probably been there for a number of years, but nobody just identified it correctly. So that's also an issue for government scientists too. But private citizens won't be looking through a microscope at zooplankton. But teachers, educators – I think if we start people when they're young, it'll probably be more effective.

I1: Yeah, have habitats more ingrained.

M: Dave Allen's daughter teaches in Ann Arbor public schools, she teaches ecology. She invited me and Rochelle to talk to students about Asian carp, silver carp, …, and what their effects might be. And they're working on projects as part of … and it's something different. I think stuff like that is also a good way to go.

I1: Just involve the community more and public schools?

M: Yeah, and maybe some outreach programs specifically on invasive species. We have Huron River days, Great Lakes Science Bowl, but something particularly about invasives would be good.

I2: Is it possible to make some commercial use of these invasive species? Cause in China, people like to eat freshwater crab, which now become invasive species in Europe, especially in UK and Germany. People in Germany think maybe we can catch this crab and export to China.

M: Well, that's one of the things that people talk about with bighead and silver carp. Lots of agencies have tried to increase the demand for the fish, people in the US unfortunately don't want to eat a lot of fish. They've tried exporting into China, but it's all, how much does it cost to catch the fish, by the time you send the fish it's much easier to eat the fish over there than import from the US. The money thing doesn't work. But subsidizing the price for catching fish

would actually be really valuable. The other thing is, I've tried both bighead and silver carp, I went to China and tried black carp and grass carp, they're all really good, depends on how you cook them. Just getting more people to try them would be great.

I2: Because most lakes and rivers in China are polluted, so people don't trust the quality of the fish and rivers in China.

M: The Illinois River and the Mississippi River are probably cleaner, but not by much, of these rivers in China. If they got in the Great Lakes, certainly that would be a good solution. So I think getting the market demand, working on that. And that's a good example of getting private business involved. But the state of Illinois has been trying to work with people who are coming in and setting up fish processing plants and then preparing the fish for sale. It's just the money hasn't been there and getting the demand up and then subsidizing. Right now, they spend millions of dollars a year dealing with these species, so if you could get an incentive, spend some of that money, spend some of that money on incentivizing that market for those fish. You'd spend the same or less amount of money and take care of your problem. But some people say, you set up the market for these fish, then the incentive is to keep the fish there, sort of a catch-22. That's actually a good example of private government partnerships.

I1: Are there current examples of that happening in the great lakes, not specifically in the great lakes, for invasive species?

M: For commercially harvested fish, not really. The fish that are commercially caught and sold to restaurants and supermarkets, there's very few species, there's the lake white fish, lake trout, walleye, yellow perch. There's not much subsidy of those fisheries.

[00h28m21s]

I1: So for invasive species, are there examples in there so far?

M: Government paying people to try and get rid of them? Well, not really. I mean, other than

silver and bighead carp in the Illinois river, and they're not in the great lakes yet. We have sea lamprey, which other government agencies are trying to deal with right now.

I1: We also wanted to ask about how invasive aren't just harming the ecological functions, but also harming industries, agriculture, and tourism? Do you see potential for partnerships in those areas?

M: Tourism is certainly a byproduct of the effect of the invasive species. Some invasives – they're had big effects but there have been some benefits for them coming in. So the quagga mussels, zebra mussels got in lake st clair and turned in from a very turbid ecosystem, not much plant life, by filtering the water, they cleared it up. So the value of that fishery probably jumped up as a result of that. Not that you'd want to bring mussels into a system. In Illinois, people have tournaments for killing carp with spears, and shields to protect silver carp … they have carp fishing derbies, encouraging them, I don't think it will have a big impact on the population, but it generates interest and income. And the salmon is an invasive species in the great lakes, the pacific salmon. When it was brought in, the whole idea was to help control other invasives. That is an example of the state of Michigan and other states working with federal hatcheries out west to bring the eggs in to start a fishery that's worth a few billion each year in sport fishing.

I1: SO it seems there could be a lot of recreational value in being able to use the invasive species.

M: Yeah, depends on what species it is. Another species is the snakehead fish, from SE Asia. It was introduced, probably dumped in the Potomac River. It's a voracious predator, able to survive out of the water for hours. It can wriggle into another pond. It was because it eats so many fish and because it survives well out of water that people are worried. Sometimes when invasives get in and are established, people find ways to make money off them. It's one way to deal with them, but not a reason to bring one in.

[end of interview]

Bob Grese interview

Wide variety of different partnerships around the state – some better organized than others. For natural land management, there are land conservancies around Michigan around Michigan. In Ann Arbor, group called Legacy Land Conservancy. Southwest Michigan land conservancy covers a lot of counties. Most of these groups are protecting farmland and significant natural lands. Partnering with local governments to protect land. Legacy Land Conservancy works with the county, for example, to protect land. Land trust may be one avenue.

Different watershed groups. Huron River Watershed Council or the Clinton River Watershed Council. In Northern MI, group called “Tip of the Mitt”, watershed council. These groups working on water policy issues and reduce reliance on policies that promote certain pollutants or water use issues. For example, HRWC urging people not to use asphalt-type seal coating on parking lots/driveways that leak contaminants. Look at other alternatives to patching driveways. Also, handle stormwater better than overloading sewer systems around the state.

Stewardship Network – help coordinate land and water stewardship efforts, extends into some of neighboring states. In model, wherever there is interest group promoting stewardship of natural resources. One in Detroit, Oakland county, southwest Michigan. Each month, have webinar about environmental issue. If particular issue NOAA wants to get the word out about, this network could be a good avenue. Based out of northern Michigan, Michigan Land Use Institute (Groundwork), deal with transportation and land use issues, promote helping communities with better planning and policies towards land use. In some ways, serve rural communities better than bigger cities. Serve as interface between legislature and government agencies and non-profits in promoting wise land use management. Could be good partner. A lot of alumni from Michigan and SNRE. Land Information Access Association (LIAA) help communities with access to GIS information, provide technical planning information. If community wanted to do broad survey about an issue, have expertise to run it as a non-profit. A

lot of work with smaller communities around MI. Help communities to be able to use GIS information or other land information effectively in planning.

Environment Action Councils. Two in Michigan. Michigan Environmental Council deals with broad array of environmental policies across MI, like promoting different energy options to looking at water resources. Serve as umbrella group for state environmental organizations, represent more local organizations around the state. Push environmental policy. Director Christopher Kolb is alumni at SNRE and former congressman, lives in Ann Arbor. Western Michigan Environmental Council (Grand Rapids) and eastern Michigan Environmental Council (Detroit) deal with environmental justice, water, try to connect policies with local people. Website for Michigan Environmental Council has list of organizations that are members of their groups, useful clearing house for environmental organizations across Michigan. Includes watershed groups. Good place to start in looking for environmental organizations that exist across the state. In SE Michigan, SEMCOG help with transportation, things that don't fit into one community. Different governments band together to do things at a regional level. Include southern 5 or 6 counties. Council of governments important in helping to disperse funds and settle problems. Maintain some of the census data. Michigan Natural Features Inventory (MNFI) part of MSU extension, serve as record keepers of rare/threatened species in MI, do biological surveys, serve as natural heritage program where there are unique plant species. Work with local governments to do surveys. For example, worked with Oakland county to do natural survey of unique areas in the county to help with future planning efforts. Rare plant and animal species. Do management plans, such as recovery of a rare species, or when permits are needed for anything that impacts rare species. Services include land use planning, conservation planning. They work on grant basis. Help map citizen science, such as how invasive species are spreading across the state.

There are useful agencies within the state government as well. Most within the department of natural resources or the department of environmental quality. There are individual consultants that work as environmental planners, dispersed across the state. Likely Ann Arbor and Lansing have the most planners. Detroit, Grand Rapids, Kalamazoo, Traverse City are where these consulting companies can be found. An example of a consulting company is Environmental

Consulting and Technology (ECT). In major cities around Michigan, do consulting around various environmental problems: engineering, landscape architecture. Some SNRE graduates work there. Ann Arbor office is good contact. Director is Sanjiv Sinha (ssinha@ectinc.com). Some tell him Bob Grese recommended him. Another group is the Heart of the Lakes, conservancy group.

James Diana interview

Bigger partnerships through Sea Grant, part of SNRE. Group of extension educators to look at coastal resource issues. Cooperation with private group to manage exotic species, especially plant species. Restoring Lake Sturgeon to St. Clair. Lots of government labs. Working on local issues, providing accurate scientific advice to management. Aquaculture, help state understand aquaculture impacts. Worked a lot with Michigan Aquaculture Association, to help define what aquaculture is and to help public understand advantages/disadvantages. Work with businesses, such as Indian Brook Trout Farm, to help minimize various damages. Aqua Growers – aquaponics near Detroit.

Whole Sea Grant program funded by NOAA. Hired through Michigan and MSU. 33 Sea Grant programs across country. Now have 7 extension educators who live in coastal communities. Have different expertise – fisheries and aquaculture, fisheries & tourism, etc. A goal is to promote sustainable commercial development. Philosophy of bottom-up interactions with communities, to give them more autonomy to direct own programs. NOAA roles include enhancing tourism, coastal community development, working with charter and commercial fishing, and aquaculture. A lot of coastal communities are suffering. Aquaculture may be able to provide a lot of benefits commercial fishing did. For an isolated coastal community of only 500 people, boost to economy could be a big deal.

There are ways to settle out solid waste from fish and remove them. Phosphorus and nitrogen are potential pollutants. Required to have discharge permit. Can discharge into big wetland, which absorbs phosphorus before it gets to receiving waters like streams. Aquaponics is

another option for reducing discharge, however, takes a lot of technology to run something like that. In net pens, everything goes into water – see what can be tolerated without a big change in ecology. Using net pens in the US waters of the Great Lakes is uncharted territory, so impacts are somewhat unclear.

Most of aquaculture growth occurred in the last 30 years, compared to the thousands of years agriculture has been used. More sustainable to grow fish than catch wild fish, but most people will have a preference for buying wild fish. Matter of perception and trust, rather than a matter of documented problems. Monterey Aquarium – program for teaching what fish catches are sustainable. Question of how to balance wild fisheries with aquaculture. Aquaculture impacts vs impacts on the systems when you are wild fishing.

Biggest public cooperation of Sea Grant is through research and outreach. Youth education is big – cruises to teach kids about science, classroom component. 250,000 kids have gone through the program. Developing cooperation of working with marinas. Cities haven't yet figured out how to sustainably manage these coastal resources. Also, worked to develop better understanding of water danger, rip currents, safety gear. Group contacted Sea Grant about net pens and aquaculture as a way to develop the economy. Group form Lansing trying to get grant to expand aquaculture. Value added commodity from recirculating aquaculture. Other potential opportunities include working with local governments that need NOAA data for aquaculture projects. For example, the LSA project will help recirculate energy.

James will give us names of educators working with local communities. Elliot Nelson (from SNRE) is a potential contact.

Sonia Joshi interview

I1 = Interviewer 1 (Jerry Guo)
I2 = Interviewer 2 (Zhanyang Gao)
F = Interviewee (Sonia Joshi)

I1: [Explanation of project and what goals are].

I1: We want to start off with asking what are the different types of end users NOAA is working with right now in regards to harmful algal blooms (HABs)?

F: So primarily it's local public health decision-makers. So far example, the municipal drinking water treatment plant operators, so cities for example. Toledo – drinking water intake. Monroe, which is located in Michigan. Sandusky, Cleveland, …pier, there's several of them. In addition to many of the county health departments that are located along the coasts for people that are going swimming, in Lake Erie … as well as state agencies. DEQ, Michigan Department of Environmental Quality, Ohio, PA, Ohio Department of Health. So primarily local government agencies, but most recently, we've been focusing on establishing relationships with the fisheries community as well, so a lot of sport and recreational fishing associations and charter captains.

I1: So is there any organization or organizations that are really affected by the polluted water? For example, Coca-Cola in India ran into problems because the groundwater was particularly polluted. So do you know of any organizations like that that are having a similar problem?

F: In general in the Great Lakes, or related to harmful algal blooms?

I1: Related to harmful algal blooms.

F: I'm not familiar. They're probably is, but I'm just not familiar. And you're thinking about companies and businesses that are affected?

I1: Yeah, that are being affected mainly because of the water being a large part of their products.

F: Well, it's not necessarily companies, but what I have heard being involved in Lake Erie types of meetings is, for example, the state of Ohio's tourism being affected, because of the blooms and hotels have been affected related to tourism.

I1: Do you know how partnerships would be able to improve the use of some of the tools developed by NOAA and GLERL, like the HAB tracker and other technologies?

F: Like existing partnerships that we have?

I1: Yeah, either existing or new partnerships?

F: I feel like – because I've been doing a lot of feedback assessments with our end-users, they feel like what we're providing is sufficient. They do have suggestions for improving things, which is why we developed HAB tracker. So I think probably these wouldn't necessarily be tools that NOAA could actually develop, but – so we have predictive tools for harmful algal blooms, but they want to know predictive tools for nutrients or, you know, of water temperature and things like that. Well, water temperature we can do, but there are certain things that they ask that NOAA just doesn't do research on, but then those are things that I can share with USGS (? I think) or other agencies that do conduct that research. I don't know if that answers your question or not.

I1: Yeah, so kind of something that NOAA might not focus on, but another organization does, that might be an avenue for partnerships?

F: Right (nods in agreement)

I2: Yeah, NOAA do a network on the forecast on the harmful algal blooms, but in order to

mitigate the harmful algal blooms, NOAA has to work with another organization for it, because a lot of nutrient runoff comes from agriculture. So does NOAA have such partner?

F: Yeah, so I mean, we do have partnerships with a number of agencies that are doing other aspects of work or mitigation in general with Great Lakes Restoration Initiative. Each federal agency, for focus area 3, which is what harmful algal blooms is kind of under, that umbrella, there are other agencies that are really focused on reducing nutrient runoff and that type of thing. Our work is to then validate or see how successful those nutrient reductions are. So I feel like we do have those partnerships in place so that two agencies are not doing the same type of work, but are complementing each other's work.

I1: Also, in the partnerships for information-distribution, are you also looking for partnerships to help gather information?

F: Not necessarily. The researchers do have partnerships with other scientists who share information with them, and for me, I have other people, communications people who I'm sharing information with. So at this point, no.

I1: So mainly looking for partnerships to help distribute this information.

F: (nods in agreement) And getting feedback on this so we can improve the information or how we're delivering the information so that it's more useful or more easily understood, that type of thing.

I1: So is the main areas of concern right now in the Great Lakes in Saginaw Bay and Western Lake Erie?

F: And then also in Green Bay of Wisconsin.

I1: So those are areas you think partnerships would be most helpful?

F: Well, I mean, yes, but even within the state of Ohio, in Wisconsin, a lot of local inland lakes have harmful algal blooms problems. But again, NOAA's research is supposed to be on the Great Lakes, so those are separate partnerships that state agencies are developing with other entities to address what's happening in the local lakes rather than the Great Lakes. But yeah, for the Great Lakes, it would be Western Lake Erie, Saginaw Bay, and Green Bay, Wisconsin.

I1: Do you have any documents that kind of go into more detail about some of NOAA's existing partnerships in harmful algal blooms that kind of details the roles of each party – like, what are the roles of NOAA in this project, what are the roles of the other organization?

F: Not formally, I mean, I would have to search and see, but I don't think we have written up anything formally that says this is what NOAA does, this is what EPA is doing, this is what US Department of Agriculture … Maybe somebody has, but …

I2: Yeah, because Jerry and I are trying to create a methodology for evaluating the potential partner for NOAA. Our partner includes information producer, information distributor, and information end-user. So for the information end-user part … until now, we collect many information about how organizations work with NOAA to produce information, but in the information end-user part, we don't have such good case to do some research. So if you can give us some best practice about this part, it would be very helpful.

F: In particular with the end-users?

I2: Yeah

F: Yeah, let me think about that. And can I get back to you?

I1: Sure

[00h10m50s]

I2: So Jerry and I are very interested in why Lake Erie has such a huge harmful algal bloom problem compared to other lakes.

F: Sure, yeah.

I2: Why

F: That's the maybe one billion dollar question. [everyone laughs]. I think part of it is because all around Lake Erie, it's very heavily agriculture. The watershed is very – it's just agriculture. And also, Lake Erie is one of the most shallowest of lakes, the water temperature is warmer. So I think it's kind of just the perfect place for the blooms to grow. But in particular, it's because of the nutrient runoff and just the shallow, warm temperatures that are really just good conditions for blooms to occur. And one thing the scientists have been saying is once you generally have a bloom, particularly if it's a pretty thick bloom. That possibly that, the microcystis, which is the species of harmful algae that we're studying, can just remain in that water system. So it's there, it's basically growing every single year. Over winter, it's still available there. So that's why it's ballooned into more of a problem.

I1: That's interesting. So are there similar conditions in Saginaw and Green Bay?

F: Yeah, not as bad. Western Lake Erie in the Great Lakes is the worst, but in places like in China and even in Brazil, they do have similar problems as well. And the lake systems, particularly in China, which is where Tim's right now because he's been working with Chinese government. They have a similar lake, pretty similar to Lake Erie which has very bad problems there, and it's because of similar issues.

I2: I come from China, I come from Shanghai, so there is a lake named Taihu.

F: Yeah, it's a big problem there. And outside of the Great Lakes in Seattle, Washington, … has harmful algal bloom problems, Florida has harmful algal bloom problems. So there are other places that have similar issues, but those are saltwater systems, whereas we're a freshwater

system.

I1: So how would the restoration process differ based on freshwater vs salt water?

F: Well, it's just different species, so we can – the research that we do is different than what's happening in a saltwater system, because the growth factors of what promotes the growth of the blooms is different. So how it's affecting people is a little bit different as well.

I2: So the impact of the harmful algal bloom to the coastal area is visible or not?

F: Oh, yeah. It's definitely having a effect. Certainly, they post signs on the beach. The drinking water intakes have told us it's an issue for them, but they've been able to treat most of the time with no problem, majority of the time. And then, like I mentioned, the hotels, tourism, they've been saying it's been affecting them as well.

I2: So now, what does NOAA use to monitor this? Use satellite or use some remote sensoring?

F: Yeah, so NOAA is using multiple ways. Satellite imagery, remote sensing, as well as an airplane that flies under the clouds, because the thing with satellite imagery is that if you have cloudy conditions, you will not have good satellites, so NOAA has begun using what's called hyperspectral flyovers, so it's a special sensor that's attached to a plane that gives higher resolution images of the harmful algal blooms, and then a unique algorithm to correct for if what we're saying is actually the microcystis bloom or not. And then we also have intense monitoring that's going on every single week. And then we've got buoys that are in the lake as well to monitor more the relationship between nutrients, other algae species, and microcystis growth. So there's multiple components to it.

I1: Do you see any need for citizen science in terms of communities themselves gathering data to help?

F: Yeah, definitely. So actually, next summer I'm going to launch a citizen science program with

actually the charter boat captains because they're already out pretty much every single day out on Lake Erie. So, Tim Davis, I don't know if he developed technology, but NOAA's phytoplankton monitoring networks – they have these special cards called FTA cards, and basically what … citizens would do is collect samples and just put drops of water on this card, and then based on what color they turn, you can determine what the algae species is. It's a good way of educating them, but then also having people out on the lake serve as our citizen scientists so we can see if the bloom is in certain areas or not to help validate the forecasts as well. But years ago I also did things similar on the west side of the state, but not using the cards, they were collecting the samples and then the field station was analyzing them for the microcystis.

I1: Yeah, we think it would be really good if a project could also have some educational components for local community.

F: Yeah, definitely.

I1: I think that's all our questions.

F: Sure. I should also mention that if you guys search for GLOS, the Great Lakes Observing System, they have a Lake Erie harmful algal bloom viewer, which is kind of a data portal. That lists a number of different universities and the agencies that have buoys in western Lake Erie for sharing data. So there's a lot of partnerships like that, and they might have something that's written up formally about this. They aren't written partnerships, but people are just willing to collaborate.

I1: Yeah, we'll check it out.

F: Yeah. I can also email you guys some examples of different organizations that are collaborating on harmful algal bloom – kind of work.

[end of interview]

Terry Heatlie interview

Recently, NOAA Fisheries agreed to partner with Great Lakes Commission, Ducks Unlimited, and (maybe) Nature Conservancy.
NOAA wants to see grant proposal have strong team to work with in restoration project.
Concept of partnership strong component in restoration work.
A strength is NOAA brings money to the project. Terry's role is as technical assistance (technical monitor), or finds somewhere in NOAA to help in the project. As technical monitor, look at environmental compliance of these projects. Run project through procedures for compliance through NEEPA. In addition, monitor progress of project. Participate in technical and construction meetings. Strongly advised to get to site before work begins to see what area looks like beforehand. After done, make sure it is completed according to the plans.
Had projects funding spawning reef in St. Clair river.
Great Lakes Commission have presence all around the GL. Help NOAA with GL-wide approach to coordinate with areas of concern for particular projects funded.
Have prioritized list of areas of concern. Work closely through EPA (GLRI funding). EPA divides money amongst all the agencies. NOAA works with EPA and other federal agencies to figure out where areas of concern are. Plan is to do restoration necessary to delist.
NOAA Fisheries has some small projects in Saginaw Bay with Ducks Unlimited (maps, planning, etc.) Haven't funded any implementation projects yet.
Doing a lot of work in Detroit River. Big project at Stony Island (restoration of shoal – placing rock around existing wetlands starting to be degraded by physical forces). Doing some habitat-type work around that to promote fisheries, bird-nesting, amphibians. About to get funding for Celera Island (closer to Lake Erie), similar type of restoration work will happen.
Detroit River, St. Clair River (most restoration work for delisting is wrapping up).
We focus on fish and habitat-related projects.
Impairments we don't directly involve ourselves in – fish tumors, aesthetics (don't fund projects that directly make a place more beautiful).
NOAA puts out announcement that says we are looking for partners in areas of concern, short

list of what we want help in – how we get partners.
We are always looking for more help in the monitoring of these projects – did they build it as they are supposed to? Are results being produced? Always fund monitoring – usually sampling before the project and then sampling period to show fish are around, looks like it's working. Would always like to do more monitoring – but can't keep funding going as long. Terry sees this as a deficiency.
Also looking for outreach on the success of these projects. Get word that these projects are happening, what they're doing, that they're successful – advertising. Important to show that what we did works, let Congress know. Group of NOAA goes to congressmen around Great Lakes and let them know what we did (Jennifer Day also part of this). Hard to reach general public after projects are done, not a lot of promoting – Terry would like to see more of this. There is a level of public education, public outreach that we expect. Proposal gets extra points if they have a strong outreach component in their plan. Would be good if we have a chance to promote these projects.
How can third parties help monitor and report results of restoration projects? NOAA has been trying to team up with GLERL for monitoring. Not really what researchers at GLERL do, so it's a struggle to work. Would be nice to work with GLERL on some of restoration projects. Suite of restoration projects to get long-term monitoring.
Some monitoring could come from students. Terry's work in Muskegon use students to do some of the monitoring. They can keep track of amphibians in certain area long-term. Long-term is valuable, even if it may be fairly simple.
In Muskegon Lake, for example, GLERL has field station there. Grand Valley State University (Water Resources Institute) is another partner for Muskegon restoration projects. However, NOAA can only fund so much, longer term restoration is difficult. They need to make money, can't just do it for free. Would be nice to have something similar in other project areas. Local universities would be awesome.
In Wisconsin, university did monitoring (fish surveys – before and after project was done). Getting a year or two more monitoring would be ideal.
Nationwide, trying to fund longer-term monitoring efforts. In GL, habitat restoration budget is larger than all other offices combined, thanks to GLRI. This helps do long term restoration work. Other parts of country have competitive cycle for small amount of funding. In GL, there is large

pot of money to fund projects in GL.
Tier 2 monitoring – look at effectiveness of projects. Developed questions vetted for fish passage. Questions we would like answered for effectiveness monitoring. Fish passage is a strategy. Shellfish, quagga mussels. Hydrologic reconnection is another strategy. Reconnect flood plains to larger rivers and streams. Dam removal is more of a fish passage (upstream, downstream of dam).
Dam removal is something we do a lot. There aren't many areas of concern that have a dam in their footprint. In GL, we don't do a lot of dam removal. Terry has done dam removal in Wisconsin. Mostly done in northern Michigan, tributaries of trout streams.
Coastal resiliency – funding announcement, received proposals. Getting more attention lately because of climate change, water level changes, sea level rise.
A lot of money in GL right now, promoting a lot of work.
Maybe can find partners that volunteer to do monitoring of projects. Communities, elementary schools, citizen science. Media companies to do distribution.

Bradley Cardinale interview

I: Jerry Guo
M: Bradley Cardinale

I: So what environmental issues do you think are a good match with NOAA's current capabilities in the Great Lakes region?

M: With their current capabilities. Hydrologic modeling, so anything involving lake level changes. Climate modeling would involve extreme events, climatic events. Obviously, the harmful algal blooms and hypoxia are a key one that NOAA's really developed a lot of expertise on. And then to some extent, invasive species and the management would be the four that I would say NOAA's current expertise is quite good and well-matched with the GLRI, with the restoration initiative funding for.

I: So based on your previous work in restoration ecology, what kind of role does NOAA play in these restoration projects, usually?

M: NOAA was not involved in any of the restoration projects I've been involved with previously. The ones that I've personally done have been funded by local organizations or agencies interested in, say, salmon restoration in California. Or alternatively, they've been funded by US funding agencies, general science like the National Science Foundation. If we're thinking just in the Great Lakes what is NOAA's role? Is that - ?

I: Well, I think we were kind of asking if NOAA was to be involved in these projects, what do you think a potential role for them would be?

M: So there's a couple of roles. They're one of the big funders of this, right? So they're one of the agencies that's distributing the money from the Great Lakes Restoration Initiative. So that puts them in the position of responsibility to be deciding what projects get funded, which also puts them in the responsibility of doing assessments on how their funding portfolio has been effective. I think NOAA has been very good at distributing and funding the money, but have not done much assessment to decide if the money's been well spent, and if restoration has actually occurred. So we do not presently know if we have wasted our money or whether it's been well spent and has actually restored something. Obviously, after being responsible for the distribution and assessment, NOAA's got a lot of the expertise here in a place like GLERL, that some of the other partner labs. Where they're some of the best scientists on the Great Lakes doing those on-the-ground projects. They don't have the expansive expertise to do it alone, so obviously they need to link with other organizations or universities. But they do have particular expertise that allows them to take lead on some of these projects. And then afterwards, NOAA ultimately is the connection to society for managing those restoration projects. The agencies that are doling out the money, I think are responsible for making sure those projects are manned, are successful, and socially acceptable in the long run. And so NOAA has to create products that allow people to take advantage of those restored ecosystems and support and sustain them through time.

I: So is there anyone in the field that you would recommend that we talk to if we wanted to find out more information about areas for partnerships in restoration ecology?

M: Have you talked with Dr. Dave Allan yet? I'd recommend Dave Allan. He's a professor emeritus, so he just retired from SNRE, but he's on campus frequently. And he's been very influential in getting money for the GLRI funded, he's on panels that recommend where it should be going, he knows a lot about what's being done and the connections that have to be made to make it happen. So I think he'd be quite a good one.

[end of interview]

Catherine Riseng Interview

I1 = Interviewer 1 (Jerry Guo)
I2 = Interviewer 2 (Zhanyang Gao)
F = Interviewee (Catherine Riseng)

I1: Introduction to project and its goal

F: I'm a little bit involved in a partnership with NOAA right now.

I1: Through Sea Grant?

F: No, actually. Through my research. So Michigan Sea Grant is a partner with NOAA in many things, so yes, I'm involved at Sea Grant, and we can talk about that too, but I have two jobs. One of them is [a] researcher here at SNRE, so I have an office here. The other part is Sea Grant, and all of our funding comes from NOAA, and so we work closely with NOAA on many things, and in fact, Rochelle Sturtevant, she is the liaison between GLERL and Sea Grant. She's actually a Sea Grant employee at GLERL and she works with the Great Lakes Sea Grant

network, so we're pretty well coordinated with a lot of the NOAA initiatives. So that's one thing, there is research there and I run the research program at Sea Grant. We actually have a student – we're funding some student research this year and we have a student who's working with Tom Jorgensen at NOAA – GLERL and a faculty member at Michigan Tech – she's working with Tom to come up with an algorithm for satellite imagery to be able to help better understand the influence of the Detroit River on the … on the dynamics of the HABs within the western basin of Lake Erie. So there's where we're funding a student who's actually working with a GLERL researcher. So we do fund – this is just one example – we fund a number of research projects … Sea Grant. But in my role as a researcher here – I've done a number of things in the Great Lakes, but the most recent one, and the one in which I have a collaboration with GLERL is something called the Great Lakes Aquatic Habitat Framework. And that's a geospatial framework and database for physical, chemical, and biological data in the Great Lakes. And so we have a website … So this is the project, and it has a framework you can download, it has a whole suite of data that people can go in and download that includes things like … boundaries, biological data – there's a whole lot of biological data that's available. Geomorphology, hydrology, landscape, mechanical energy, temperature. We also have … the whole idea is that we've developed a sort of a spatial framework, sort of like a GIS-grided network that we've laid across the whole Great Lakes basin, we've … all the data that we have to that spatial framework so that all the data that's out there can be referenced to one location. If you're in one spot, you can get all the data for that spot. And we've developed watersheds, consistent watersheds across the US and Canada which weren't existent before. And so this has been of great interest to a number of researchers and federal and state agencies. They're interested in this and working with us and one of those is GLERL. And so we've talked with them about the framework and they're trying to figure out how they can work with us to help support and potentially host the GLAHF project in the future. So that's one piece, so Debbie Lee and Philip Chu and [An]drew Gronewold, those are some of the people that we've worked with there that are interested in that perspective. One of the co-PIs on this project was Ed Rutherford, and he's out in GLERL, he's a fish ecologist, so he was helping with thinking through and deciding this project. So there's lots of NOAA connections here. But we actually have a small grant from NOAA through CILER right now to help them with the project called the ... hydro (?) which is whether something forecasting hydro. It's this national project where

they're going in and developing sort-of process-based models to estimate flow in rivers, which hasn't really been done. People can look at what is the total flow statistics for a total year, but they don't know what it looks like from hour-to-hour. So they're developing this model that can sort-of predict what the flow looks like on a daily – even on a hourly – basis. And so they're interested in these waterway boundaries that we've developed, and they're interested in the data that we have that can input into those models. Because they're based on landscape characteristics like land use, soils, vegetation types and slopes and things like that. So we are already linked a little bit into NOAA and some of their initiatives. We also worked with Drew and my staff person on a paper. So we looked at – we have the surface water temperature and the ice cover temperature that NOAA has, is a part of, and hosts some of that data. And we took and we … that data to this grid framework, which is pretty fine-scale. So we were able to work with NOAA scientists and look at, well, what is the spatial variability of these changes and … for temperature and ice cover. Much of the research that NOAA's done has been looking on a lake basis, or maybe, I don't know, sub-basin. But never fine-scale – how does it look like in the Georgian Bay compared to Green Bay compared to Northern Michigan compared to Southern Michigan. And so our framework allows us to look at things at a much finer scale and at multiple scales across the Great Lakes. I already sorta have a connection with them and working with them on this project we've developed. Questions?

[00h08m37s]

I2: Yeah, that's very interesting topic.

F: Yeah, you should go check it out.

I1: So do you think there's any additional projects in this area that NOAA would be able to contribute more towards using their resources?

F: I think it's a little of a back-and-forth, a little bit. We can contribute data towards NOAA, but NOAA can turn around and contribute data and they can contribute funding support – you know, those kind of things. Or server support or technical support, those kinds of things. There's a

project that is at NOAA that actually, Rochelle Sturtevant did, the GLANSIS one. We have that data, her data, here with us. There is other data out there that we have that we could potentially link some of the invasive species data. We have all of the shipping data here, so we can know where there are major routes of shipping. And I know also that there's people that, there are different researchers that are looking at factors for transporting invasive species. So that's something that we could link into this framework and sort of compare and look at what all these data and models tell us. So that's the kind of thing that NOAA can share with us and we can share back with NOAA. If they need the data … Ed Rutherford is working on a project where he's doing some modeling of a couple of invasive species, like hydrilla is one … But they were using data from this project to input into models that looked at likelihood of invasion of different areas around the Great Lakes, depending on habitat conditions. So we know that they've done that work and it's getting published, but once that work is done, they can share those model results with us, and we can put those model results into the GLAHF framework and someone can go, "Oh, what does it look like for hydrilla? What is the likelihood of invasion?" And they can pull up that data and they can look at it. Because we have a tool that enables you to go in and look at different … So these little red dots here are poor(?) points for all the different watersheds of the Great Lakes. And this colored map here is looking at ice duration, and that is, if you look at this little … here, it will tell you what is from ice cover data that is derived from NOAA environmental ice cover data. And they're being summarized between December 31st and May 31st, and it doesn't say the timeframe here that it's being covered for. So we have this visualization of our data here, so we could then add those model results to this visualization and then look at those kind of results. We have another project that we worked at, and this was funded by the water center, and again, we had some NOAA scientists that were advising on this. But we wanted to look at kind of developing a decision-support tool. So this is just for Lake Erie, and it's looking at basically fish habitat, different criteria for fish habitats. So someone might want to say, "Well, where do we have cool water in the Great Lakes, and where do we have coarse substrate and in the shallow offshore and deep nearshore?" [inputs data into program] Still working. But what they're doing is showing all these different areas and where the intersection of them is supposed to be in green. So these are the kinds of things we can see doing down the road and doing for different things. Developing other decision support tools. So those are the types of things we can work with NOAA on, and we'd like to work with NOAA on.

I2: Yeah, I think it's very cool. If you put some criteria it should make different results on the map.

F: Right, exactly! So this is so people can develop their own criteria and still working. What this tells me is there's not much area that's like that, that is cool, coarse, and in these depth ranges. But it's this area here that's where we have that kind of habitat, just mostly right there in that central basin. Cause we know that eastern and western basin of Lake Erie is really shallow, so it's always warm, it's pretty shallow. So here we have more deep water, where we have the cooler ends of Lake Erie. So if someone wanted to look at where that kind of habitat exists, it's out in green.

[00h16m00s]

I2: Because one of our interesting topics is how to utilize the data to help the coastal community on decision making, how to do development and construction projects. So maybe we can use this database, we can put data into the database, we can check the map to see what area is good for development or what area is not good because the way development happens will have an impact on the ecosystem?

F: Right, right, no, that would be really good. So right now, we don't actually have the capability for people to add their own data here. We've talked about that. It was a bit beyond us. On some level, if this is a – if all the data that is here comes from high quality data sources – we've QAQC'd it, we've checked it for any errors so it's good data that's here. If we allow people to start adding any data, who knows what'll happen … [laughter] … But people do want to do that, you know. We would like to be able to have the capability for people to create a map like this and add in their own data. But they would have to do that on their own separate window and they could just add their data to that window and save that window, but it wouldn't go into the GLAHF database. Per say, it would be their own database. Now, what they could do is you could download the framework, you could download the data on your own computer and add all your own data to that. But developing a decision support tool is another challenging effort, so I

think what we would like to do is have a whole suite of decision support tools that are part of this explorer so that if there was another question like that, if we could develop another page that's … some other big question like that and develop these … so based on the capability of this data, there's so much data and it's really hard to process that. Especially doing it online from a server. So what we've had to do is sort of take and summarize that data down into specific criteria. So it takes a little bit of data processing, working with like a user group to, OK, what are the criteria? And then we should be able to do that. And now that we've worked through all of the headaches of how to do this, developing the next one shouldn't be such an issue. We should just need to know what is the question, what's the user group, what's important to them, because one of the things of what we did here was we worked with one of the professors out in urban planning, and his area of research is sort of policy and developing tools that are usable. So often for researchers, they go in and develop tools because they're what they wanna do, and it's interesting to them. But no one else cares, and no one else uses them. So our idea was, we wanted to, yes, we wanted to enable people to use this, but we needed to go in and we needed to ask the users what was important to them. So we worked with the Lake Erie technical group that's part of the Lake Erie management group both on the US and Canadian side. And they gave us all this input on what would be useful for them. So that's what we did. So I think if we did other decision support tools, which I would love to add to this piece and that would be a really great application, we would what to work with what user – who is this important to and what would they like to get out of it? So we make sure that we make a tool that's useful.

[00h20m07s]

I2: Yeah. When we identify the partner for NOAA, we divided the partners into three groups. One is the co-information producer with NOAA. The second one is the distributor of the information. The third one is the end-user of the information.

F: We're sort in those last two. We sort of are the ones that can take and distribute and then figure out ways to share it. We also are developing a little bit of data too, though. Like we have one piece and I don't know if we could – for instance, this map here is something that we

developed from surface water temperature using a model or algorithm that was previously developed for surface water temperatures, and they compared those from day-to-day to see if there was a big change in water temperature and enough of a change. Let's say wind comes like this across the Great Lakes, which is common. It pushes that surface water across the surface of the lake. And what that does is it sets up a current, which then goes like this. This is the basin, like that, and this is the current, which goes like this. And it draws cool water up, on this side. So it pushes the warm water that way and it pulls the cool water up there. And that's called upwelling. So this is a map looking at incidents of upwelling and summarizing those over a number of years so we can see where upwelling commonly occur. So it's pulling up water from the bottom that's kind of nutrient rich water, so these tend to be areas where zooplankton hang out to get the phytoplankton, and nutrients that are phytoplankton that are there and it's also cool water refuge for fish. So these are really important areas where people like to know about. So not that no one knows about this, but no one has develop this all over the Great Lakes. And this is data that we've sort of developed that can be used by researchers. So we also do a little bit of data development but we're not the people that go out and collect data. So I think we fit in two-and-a-half of your groups, two-and-a-eighth of your groups [laughter].

I1: So is there also any plan to adapt these kind of tools for like local communities, for like non-scientists?

F: I think that's a possibility. I think we'd have to think through and figure out what it would be they would want. And I think this is more thinking about things from less of a real local perspective. So a little more thinking about things not regionally to sub-basin to basin to basin. But it could be locally, but we're not thinking about things from the term of someone going in and "I wanna know what's happening to my property." That's not the scale of this. This is a little more broader scale. We want to look at things – so someone could be in and say "This is where I live and this is what the conditions look around me and there's other …" We're doing a habitat … which we're not quite done with, but they could say, "This is the kind of habitat I have near my town or near my property. Where are other places like that around the Great Lakes? Or is this really unique? Are there any other places around the Great Lakes like this?" So that's more the type of things we would deal with around local communities, rather than the really

specific, property-based kinds of questions. Does that answer that, sorta?

I1: Yeah, but like, people can use this, but it's not really that specific. It's more of a larger scale?

F: I think it's more of a larger scale, but the smallest scale we have here is a 32 meter cell, which is similar to what you have for your landscape … cover. That's really quite small. It's like one of the smallest things that are out there. Up until now, the smallest was a one kilometer cell, right, that people used. And a lot of times, people are using more like 9 kilometers, and so it's a quite small cell, but it doesn't always get at what's happening at this one particular beach. But, knowing at what's happening at your beach, you could then look around and relate that to what's happening elsewhere. That's more the kind of thing we're looking for. And you could go in at that location and say, "Oh, what fish have been caught here?" Or "what is the temperature like here?" You could go in and pull the data out for where you are to get some idea of that.

I2: So where are the main data source for the map? So where do you get this data from?

F: Well, there's some data from remote sensing. Some of the temperature data. We have some data, some algorithms that are looking at turbidity, phytoplankton in the water. There's some coastal satellite imagery that's analyzing presence of submerged aquatic vegetation. So we have some of that data here. The ice data comes from a combination of satellite imagery but also data that's collected from ships, from buoys and water temperature is a multiple kinds of data sources as well. We also have data that's sample data that are from different spots around the Great Lakes that have been collected. There's the bathymetry data that's a pretty big deal. So that – some of that data comes from NOAA bathymetry and that comes from a long history of data. And that's really coarse for most of the Great Lakes, but then most recently, the Army Corps of Engineers have been flying LIDAR, which is a type of radar that can get finer scale returns but at a finer scale of depth out to – I don't know how deep it can go, it depends on the turbidity of the water, but they can go out about a kilometer from shore and 500 meters inland. So we have this much finer scale topo bathymetry, most of the coasts of the US side of the Great Lakes. So there's multiples kinds of sources that we have. Substrate data is often times really coarse, but in a few places it's much finer scale than what we have.

I2: Yeah, I think it is a very big project.

F: It is a big project! It took about four years to develop. We had a big grant from the Great Lakes History Trust to do this. We had a couple of grants. One is still ongoing, one was to develop these decision support tools and visualization tools and we have another one where you are using the data to do an assessment of the condition of fish habitat in the nearshore. And then we have this other small grant with NOAA to start developing these hydrologic models. So, we hope to get a few more [laughter]. Any other questions?

I2: Because we want to find some case analysis, because you have many partnership experience with NOAA, do you have any materials about the partner? Because we want to do some case study about partnership, so we want to do some further analysis to see how to maintain the partnership. So because you have long time partnership with NOAA or government agency. Maybe you can give us an example and we can do some further research.

F: Sure. Well, I've mentioned a couple of them right now. So that's something you could go back to NOAA folks and talk to Philip Chu or Drew Gronewold. You could talk about the ... hydro project. What they've done is give us a little bit of a small grant that funds me and my technical person. And we are going in and helping them with some of the GIS approaches and giving some technical advice. So we have a small grant in the beginning, but I think we've been able to contribute and may be able to get some more grants to continue to fund this. And that will help us then turn around and they can use GLAHF and further develop some data for them and the GLAHF data can be used for the Great Lakes region to develop these models. And they'll be hopefully using our watersheds and streamlines as well, which is a really nice thing for us. So you could talk to them about that. You could also talk to Ed Rutherford. He's also out at GLERL. And he would be glad to talk to you about the different collaborations; he's been involved in most of the things we've done, and you can talk to him about the collaborations we have with his modeling for invasive species. And that's the CSCOR project. And so there's been a lot of going back and exchange between groups and using data and developing these models and getting them published and hopefully the data will come back to us. But I think Ed could talk a

bit more about he's – he's been involved at NOAA to help develop this partnership between GLAHF and GLERL and NOAA. So I think those would be two big people to talk to there.

F: And Drew also worked with us on a paper. We analyzed the surface temperature and the ice cover of the Great Lakes. And so that would be, right off the back of my head, we're sort of in-discussion right now. We're forming an advisory committee that's gonna include representatives from Great Lakes agencies. So there'll be someone from the EPA, somebody from NOAA-GLERL (Philip Chu), there'll be someone from Environment Canada, there's someone probably form the DNR, there's someone from Michigan, from the Great Lakes Fisheries Trust, from the USGS. I'm not thinking of everybody right now, we have a group of maybe 10-12 people. And the idea there is to sit down and talk about what are the next steps for the future of GLAHF, and how can we maintain and sustain it? We have some ongoing funding to maintain it, but it's not quite enough. It can just maintain it, but if you just maintain it, but you don't keep on growing, expanding, it will probably die, and no one wants that to happen, because a lot of people are interested in using GLAHF. There's other researchers that have used our GLAHF and the database like this. Scientists, EPA that used our watersheds and we went in and took all the land use, land cover data that's been developed for Canada and the US. We harmonized it, we put it into common categories. And so they used that to summarize landscape change on the landscape. And so that's for the stay the lakes environmental condition, the STLEC indicators, they do that every 3-5 years, the EPA puts these out, the sustainable Great Lakes. People have used the GLAHF framework to contribute to that. There's researchers at Wisconsin and they've been doing a big research study about connectivity. You know, all the tributaries, and how those tributaries are connected to the Great Lakes. Are there dams? Are there restrictions due to the way the … are? So they've done this analysis for all the tributaries and they've been using our framework to then go in and summarize that data. So we're being used and we want to maintain that. So NOAA is involved in that group and it will I think have a voice in how we go forward and what their involvement will be like. We talked to Debbie Lee. She said, "Get Philip to do this!" [laughter]

[end of interview]

Deborah Lee interview

I1 = Interviewer 1 (Jerry Guo)
I2 = Interviewer 2 (Zhanyang Gao)
F = Interviewee (Deborah Lee)

I1: All right, so what are you usually looking for when establishing partnerships in the Great Lakes region?

F: Well, we're looking for where we can develop synergies, leverage what we're doing to produce something bigger than what we can do by ourselves. Something that increases outreach or service to the public. And we are within the Department of Commerce. So that is a partnership that facilitates commerce, you know, economic development, development of a new commercial product. All of those things are very important. We're also looking to see where these partnerships might help make gains in supporting underserved populations or underrepresented populations, either directly in terms of the involvement or indirectly as in an enhanced service or education or outreach.

I1: Yeah, we were talking a bit about structuring our project to focus more on partners where the local communities have need of NOAA services, and so we think that might be a good direction to take our project to.

F: Well, NOAA's services are very broad and they're far-reaching. Everything from maybe helping a local community restore habitat or develop green infrastructure. Maybe to improving data they have for, say, small … or recreational traffic if they would like to support a buoy or a met (?) station. Also, there's an initiative underway called the International Great Lakes Datum update, and that re-adjusts all the water level gauges to a new datum to correct for isostatic rebound, if you're familiar with that, and right now the funding is such that it's only addressed at major federal harbors. There's a lot of small harbors that would benefit from this update. So it'll be interesting if we can find, you know, a consortium of partners, perhaps it would be through

like the Great Lakes City Initiative or through a consul of mayors, that would look at helping us bring this datum update to their local community. It would be a benefit to them. Course, you're very much aware of our ecological forecast data, so how could we partner, maybe to better leverage the forecasting and the products we're currently delivering. Or people have more access to that information, to make decisions. Or how do we maybe better support those who manage beaches to make decisions on when to close or open a beach. You know, notify the public. So when you look across really the broad spectrum of NOAA, there's many things we can do. We're also very interested in some small business. We have small business programs where we look at taking some of the innovation that we develop and then letting a small business develop those commercially.

I2: Yeah, BIR, right?

F: Yes, yes, BIR. So there, I've noticed that even here in the laboratory, we've had developments and accomplishments that could have gone through that route.

I1: So I know this kind of varies depending on the partner, but what would you say are the main benefits of working with NOAA in a partnership?

F: I'd say that some of the benefits is that we're very experienced at collaboration. I'd say that we also have mechanisms that allow us to be able to do that, such as granting authority, specific grant projects. That's a way you can transfer money. We have a long – as part of our mission for service. So service, science and stewardship. So NOAA's organizationally and culturally inclined to partner. We do collaborations on a large scale within NOAA and external to NOAA. So extending it to the public is, I think, another area. We have experience doing that with Sea Grant, our Sea Grant agents do a lot of outreach and extension. And so I think they're also an avenue or an avenue or outlet, a way to help facilitate that partnership. So NOAA has many actual mechanisms by which they can formally partner. And exploring those and maximizing those would be wonderful, or think of new ways to utilize those authorizations.

I1: Right. So based on successful partnerships in the past, what are some characteristics that

you would attribute that kind of success to, of the partnerships?

F: Having common expectations, understanding that there is a good match between the two for the partnership, I think that's important. You also have to have people within NOAA invested in having the time and resources to make it successful. It's just not really a matter of … something in somebody's lap and saying, "Here you go". You know, you have to work and have a continued relationship to have that partnership successful. And the people in the private sector who want to take that on, they have to have a realistic expectation of what we can provide and what they may be allowed to do. So for example if they receive a grant, they have to be aware of how they're allowed to use that. They can't go off and use it to buy personal items or invest it – they have to invest it in the way that the program has specified it to be done. So they need to have those expectations – they need to have that education. And it behoves NOAA to help them understand those parameters.

I1: So based on what you know about previous projects, are there any projects that you recommended we study to help our analysis of our own project?

F: Yes, there's several. I think one you should definitely look at is the Great Lakes Observing System because that one is definitely built around partnerships with the private as well as public entities. And I think that is one you might want to study in-depth. You could make recommendations on how they could even further develop what they're doing. So that is one area for certain. NOAA also provides a lot of support to academics through access through our research vessels. I think that area's very ripe for looking at how we can really bring efficiency and maximize that – how do we do that, under what authorization, what governance construct, would we be able to better support researchers in the Great Lakes as a whole. So, for example, through the Cooperative Institute, we have access, I think, eight to nine academic institutions. But for those who aren't part of the Cooperative Institute, but need access to research vessels, how would we structure a relationship with them to allow that to happen. So that's the second one. Reaching out to small business with innovation, with what we do in our marine instrumentation lab or – I don't know if there's things we learned through the habitat restoration – I'm not sure about that – but we're starting to step out with the first environmental sample

processor. Is there a role for a small business to help support a network of those, maybe perhaps, in some way? Are there other ways of packaging or developing unique forecast products pinpointed for specific users? I know this happens on the weather side, where there's commercial providers of custom forecasts. And those have primarily focused on weather and I think … What is unique in the Great Lakes is there may be somebody who may be a forecast – customized forecast for specific users. Is there a market? I don't know. But is there a way we could develop that relationship. I think there are other ideas. I don't know – I'm sure there are many more out there.

[00h10m26s]

I2: So have NOAA tried to create some partnership with some private company like the insurance company? Because NOAA has huge amounts of data on the weather, on the climate. This data is very useful for the insurance company to calculate the premium for the customer.

F: Yeah, there's a great example.

I2: So have NOAA tried to create such a partnership before?

F: I believe they're actually working on that right now. They call it Big Data. So if you google –

I2: Unleash. Unleash data.

F: Yeah, big data project. And so I think they're trying to explore how to push that data out there to make it accessible for others to use commercially. It's a challenge, especially with the data because you want it to be quality – you have to be able to provide the metadata, right, and standards of the quality. And so, are we able to provide that data on that broad scale with that high level of quality. I believe we are, but I think transferring that, I think, is the challenge. How do we transfer that?

I2: How to process the data? Before the data is useful for the project, NOAA have to do some

work on transfer and process this data.

F: I think that's a possibility, yeah. They need to find out how they work with the receiver to process that data, right? Cause as a scientist you know that data is only as good as your understanding of where it came from, right, because you have to make sure you use it in ways which are appropriate to how it was collected. Otherwise, you have misinterpretations or misunderstandings if you don't understand the quality of the data – that can also lead to misinterpretations or misapplications. So you need to understand all of those things before you can blindly apply it or cavalierly apply it. And I think that's kind of the crux – how do you make that leap between an insurance industry and a science industry? I think there's lots of examples out there, though, or they're growing, at any rate.

I2: So one of direction is maybe looking for some ways to commercializing the data of NOAA already have. So do NOAA have any specific policy on the data commercialization?

F: Those would all fall under our NOAA administrative orders for data management and data access. So there is a federal policy now. President Obama signed a executive order and there is a requirement that data be available to the public. Initially, the order said one year of collection, but I think they recognize now there are some data, particularly like our biological data, that we can't have prepared within a one-year timeline, and so there would be a greater timeline for that. Often, we collect it in one year, and it takes another year to process that, another year to interpret it in scientific context before we can release it. But also preparing the metadata poses a challenge as well. How do we prepare the metadata to the required standards? That takes resources as well. This laboratory is in the process of transitioning, where the individual scientists collect their data, interpret their data, store it maybe on their laptop, their desktop, or maybe a high-performance computing lab, but did not have the resources or the knowledge to do the metadata documentation. And now we're looking at all this investment in data – how do we make it available to the public when we're not even sure where it all is? You know, it has to be inventoried. We're in the process of doing that and we're also in the process of developing the metadata. But yes, so there is a mandate for the government to share its data, it's paid for by the taxpayers, so it's public. Only if the data is considered

sensitive or restricted is the data not made available. We don't have any of that type of information here at the laboratory; none of ours is sensitive or restricted. But you can look up, if you're interested in this policy. You can google increasing access to federally funded scientific research. This also covers publications as well, publications also have to be accessible as well. And this is from the executive order, out of science and technology policy. But then that causes a cascade of all kinds of subsequent policies that come down in order to implement it. So that comes down to NOAA's plan for increasing public access. So you can google this as well, it's publically available. And so that's NOAA's interpretation of how to execute the executive order from the President. And the challenge for us in a laboratory like this that is fairly small, is how do you get the resources to comply with the order. You know, maybe there's an opportunity for partnership there. Maybe a private entity would want to help us do the metadata. And figure out commercial application for the use of that data.

I2: Yeah, if we can find a third-party organization to help us do such work, it would be very useful.

I1: So for NOAA, are third parties usually government agencies?

F: It could be other government agencies, it could be an NGO, non-government organization, it could be a non-profit. We often partner with like the Great Lakes commission – that's a interstate compact. We partner with … which is a 501c3, a non-profit organization. I know people often apply, like academics or the water center, the University of Michigan which is a separate entity from the university, often applies for grants like from the … foundation. So if they were interested they could apply for a grant and come to us to help manage the data or make the data accessible. There might even be private entities – I don't know if some of the commercial weather providers – I'm not sure what the current names are, for a while, they were changing rapidly, but maybe they have an interest in expanding out into this new area of data and services. So I think there's lots of opportunities.

I2: Just as Jerry mentioned, now we are doing some past practice analysis based on the previous NOAA case with partner. So because all the information now we have is from website,

so do you think we can find some internal document to help us do some further analysis, from NOAA?

F: If it's probably not on the web, it probably doesn't exist. The only thing we have that wouldn't be on there would be, like, memorandums of understanding or memorandums of agreement. And for those we would have to ask Sandra Salyers if there could be some of those that we can study.

I1: Sandra Salyers?

F: Yes, she's my administrative assistant. And there are other parts of NOAA … use. So for example, National Ocean Service maybe have memorandums of understanding. Those tend to be agency-to-agency versus agency-to-private sector. Those types of agreement would probably be worthwhile studying. And I don't think those would be sensitive or close hold, so depending on what they are about. So we would have to look, I think, and see where we could find those examples that might be useful.

I2: Yeah, because we want to get some details to help us – maybe from some successful or unsuccessful project we can get some methodology to help us – we can do some further research.

F: Yeah, I think studying the unsuccessful ones might be more illuminating. Understanding why they didn't take off, the underlying factors that caused them not to thrive. And so we'll have to see if we can find some of those, cause I can't think of any off the top of my head, but they've got to be out there, right?
[end of interview]

Doug Kluck interview

I = interviewer (Jerry Guo)
M = interviewee (Doug Kluck)

I: So Doug, you've been involved with the National Weather Service and NOAA for the last 18 years?

M: The last 24.

I: Oh, wow, 24. So you've been able to work with a lot of partners and groups that are climate related in the central U.S. region.

M: Correct.

I: So I wanted to lead off by asking you: what are some of the overall goals NOAA has regarding climate-based partnerships in the central U.S. region?

M: So let me see if I got this right: what are the goals of building the partnerships in the region?

I: Yeah, kind of when you're trying to establish partnerships, what are your goals during that process?

M: Well, one of the main goals, when you're building a partnership in my opinion, is that whoever you're working with, needs to see themselves as the value in what you're doing. In other words, for example, if I'm going to work with a core of engineers, or if I want to partner with a core of engineers, for whatever reason, whatever I say to them has to be applicable to something they care about. Otherwise, they're not going to spend the time – nobody has the time and resources to wasting time with anyone else's work. For example, a great example of a partnership process are these quarterly climate summaries and outlooks. There's a wide swath of partners that are coming together on a quarterly basis to put ideas together. Now, people spend their time freely, no one's paying anybody money, but it allows them to see if they can

recognition on these debriefs, and they have interest in doing so. So no matter where you're going or what you're doing, they key is to make sure the partners see themselves in the output of the final product; it has to have some value to them. If that makes any sense whatsoever.

I: Yeah, so the partner needs to be able to use something from that partnership to be able to have a positive result.

M: That's right. They have to have some value added ultimately. Now, there are a few altruistic people, not too many groups, but a few people who are willing to do anything for anybody at any time. Those are great, but those are few and far between, in my experience.

[00h03m09s]

I: Right.

M: Even people who are extremely well meaning, won't find the time to help in every circumstance that you need.

I: Right. So is there a particular reason to make sure the other partner gets something out of it, but if they just wanted to help, but they wouldn't get – it wouldn't really benefit their main mission.

M: That's right. Sometimes there may not be an obvious benefit that – some of us have been around long enough to see that – especially facetime and that type of engagement with someone. Also, key factor I guess – there's probably several key factors. One of them is to build trust with that other organization or person. For an example of that with various tribes, excuse me … federal white guy to talk to a tribe, there may not be a lot of trust, at least initially, if you're just telling them to – giving them a Powerpoint presentation … something that they may care about, but it will be really tough without sitting down and really engaging with that community or any individual for a period of time to really get anything out of it. So there's a couple of lessons there. One is facetime rather than … time when we're … Phone time, or even email time, or

however else they might get the information from you, even social networks, isn't nearly as meaningful and doesn't really build trust in partnerships for future engagements. So there's a lot of creating a base, if you will, for future engagement. And that, for my part, sometimes I'll go to meetings and really not have a lot to do there … not seem like I'm getting a lot out of that particular meeting. The tangibles, however, are all the people you meet at the breaks, and the various people you can reach back to in the future, and it may not be the next week, it may not be the next month, it may not be the next six months, but there's still somebody back there in that organization or that agency that you can always refer back to. "Oh yeah, you remember that meeting I was at with … we talked about this." And so those kinds of connections are valuable in doing partnerships. And if you don't get your face out there, literally, it's harder. Not impossible, but much harder to get people to work with and for you. And leverage – I used to use the word leverage a lot. It's funny because there's some people that aren't going to leverage a lot, and they like to joke about that. "Oh here comes Doug, he's going to leverage me again!" Anyway, most of the time, they're happy to do it because they know what the outcome is. But do they necessarily know that, unless they knew me well. Alright, so having 24 years in a particular area or a lot of time in a particular area does build up your credibility and your trust and your ability to leverage. Now, if you're a complete jerk, it's just the opposite, so you can't be completely off-putting either. So there's a way to …

I: Yeah, that makes sense, I think.

M: You can get yourself a reputation in a bad way, too.

I: You just have to be careful which way you show yourself.

[00h07m44s]

M: It's true and another part of partnerships is going in with some knowledge of who you're dealing with before you get there. Again, the old cold call, particular tribe or agency – again you can't know the whole … if you don't know what's going on in people's minds or … necessarily, but the key is to be very helpful, especially initially when you're … your big … And I'm afraid

many of us in the science and tech world – we don't necessarily know the best approach when it comes to not knowing everything. We think we're expected to know everything – science and tech – we're the specialist. Well, yes and no. I'm very open about what I don't know, which is quite a bit. …

I: Thank you for that answer. I also wanted to ask, what do you see, for a potential partner, what do you think are the main benefits they can get from working with NOAA? For example, with your climate division?

M: Yeah, so of course, it really depends on what we're talking about here, but if I narrow it down to science and tech folks who work with us, or at least – how about this, we narrow it down to decision makers, people like middle-management – what kind of value they get from us is mostly … information deliverable. In other words, NOAA is known to just spew out huge, huge amounts of data as well as value added material. So, you can look at the weather service … on what NOAA does. What matters to them on a day-to-day basis for various reasons, right? On the climate side, it's a little different because it's a little slower paced, if you will, because of not only all the information coming out, but because of what the effect would be. So if you're looking at climate adaptation or something you have time to plan for or draw out outlooks. Things like that, it's not usually a daily sort of engagement with anybody. I would say information. Information across time scales and geographic scope, from local to national. That's what I think people expect out of us. With me, particularly, or specifically I should say - a lot of people go through me for connections, if that makes sense too. So I'm a big connection. … a question and I'll have absolutely no idea how to answer their question. Like something I've never heard before, "what is the connection of climate change to bullfrogs in Missouri?" And I have no idea. But I do know some people who probably know how to answer that question. And so that's my sort of networking connection that I do. I do a lot of that.

[00h11m52s]

I: So different people at different divisions at NOAA can provide –

M: No! No, no no. I guess that's the other angle. Sometimes other people at NOAA know the answer, but most of the time, they're not in NOAA. So in other words, … I'll know somebody at the climate science center at USGS. I'll know somebody at maybe the Missouri Center of Conservation. There's all kinds of people who … answer questions at least – even if they can't, they're going to know. Even if it's a couple of jumps to get to that actual person. It may be an academic. There may be an academic at the University of Missouri right now who'd have a much better idea of answer that. So let's see, of all the requests I get, at least 50:50 of where I would send people beyond, to not just NOAA information. And that's a really important thing, I think, to stress. And it goes back to that humble and egotistical part – and I would recommend not having huge ego when you do this work, because if you do try to answer all those – well, you can't answer all those questions because those are the inquiries we get all the time – no background. It comes in agriculture, it comes in ecosystems, it comes from water resources sometimes, there's all kinds of sectors and questions that we should not be answering or not even be trying to answer. And we realize that, and the key is knowing where to send people beyond that, though. And that's great. They love the fact that you know somebody, so it works out nicely.

I: Yeah, I think as long as the knowledge is correct, then how you got it, if you got it from NOAA or you got it from someone NOAA referred you to –

M: Yeah. The fact that they're coming to me, though, or coming to us, means that there's some trust built up. I do get random emails sometimes. And those are the ones that I actually try to work on the best, or not the most, because I know that they don't know me, and those are the time you should spend the time on to make sure you go the extra mile for them so that we do build up that trust. So I mean, when we do reach back to that person in the future … on the project side … we're going to bring them into a meeting … maybe we really need that person to come in and talk someday about something … want to hear about. That's the way it works.

I: Well, thank you for that. I also wanted to ask, on the flip-side of the last question, what does NOAA want to get out of their partnerships?

M: Yeah, I guess that's a pretty broad question. Since we are an information delivery organization, we're an information producer and delivery organization, we need to be relevant, if you will, not only at the regional and local levels, but nationally and … politically … we need … positive and economic results. In other words, we're not trying to make money on anything we provide to anyone. What we are trying to do, though, is make sure we can show Congress and maybe … management that we are relevant and people are asking us questions that save them money or decisions that support what they do. In other words, they want to know if it will be flooding, or they want to know what this … will do to their bottom line. So what we really want are sort of their – these people it sounds like we want to be able to say "Thank you NOAA for that information and saving me 1.2 million dollars because I can relocate things and … when it mattered." Or maybe "we will buy this amount of natural gas this year", something along those lines. That's worth a lot in a government system because of … we're providing them.

I: So money is relevant in the context of the information and services that NOAA provides.

M: I would say money is the actualization. There's probably all kinds of non-monetary ways of looking at how we help society people … resilience information, okay. Money is the easiest one to take up to the hill, for example, and say "look, congressional people. We just saved this community X amount of dollars." That …. But when you're talking about resiliency, sort of on a local and … level, we'll say, in my view, if we can build resiliency, build a drought plan, or help to inform a drought plan or something like that, that's worth a lot to me as well. And hopefully it's worth a lot to NOAA, to point to these instances where the information that we've gathered actually, the information we have actually, help somebody minimize the impacts from some future climate event. So that goes into the adaptation, the resiliency, and all those kinds of words for long-term and short-term climate events. And what I mean by short-term is anything beyond two weeks. Two weeks to a hundred years in the future. It's not purely a money thing. It's actually fairly rare. What we get more often is "this helps me with my planning." And who knows what that's worth.

I: So kind of the overall benefit to society is a major motivation. Also, I wanted to ask, when you're exploring new partnership opportunities, what are some things you look for when you

evaluate these potential opportunities?

[00h20m19s]

M: Well, a recognition of a need for our information. To not recognize that, people usually can't go forward in a relationship. So it's really good when they come to you. If a new sector or a new partner comes to us and ask particular questions and we say, "Oh yeah, absolutely." Those are the easy ones. The tougher one is trying to engage a group that you're pretty sure could benefit from information we might have or a system that we may have. Engaging them is often a little harder, so that's one of those cases where you want to show relevance, and sometimes that's tricky. I don't know if there's any set ways of doing that other than stand up before them – face-to-face partnerships are essential, I will say that – I don't know, it's a finesse situation, in my opinion. Something you do finesse.

I: Yeah, just kind of have to show them what NOAA can provide them.

M: Otherwise, why would they waste their time? And we've had these issues before, especially with the private sector. Now, I will say this. During extreme events, or just before or just after an extreme event, you will get a lot more people listening to you. So not that we want them to happen, but I will say that they are watershed times, key times to engage different groups who really want to know when the next time that will happen or how we can prepare for this better in the future, you know? Hurricane Sandy, the flood of 2011 Missouri River, all these extreme events … The extreme events are time to make hay, if you will, that's the best time to really do major engagements. People care, people care about what you have to say.

I: So it's easier in those times to establish those kinds of professional connections with new organizations.

M: Right. Those are good times. Not saying those are the only times, other times are … broad-scale meetings … maybe go to one of their trade shows or something like that depending on who you want to meet with. Cold-calling is a lot tougher than a ready-made audience, or an

audience that's already interested in your subject.

I: You have to get them to actually get interested in your organization.

M: Right. And believe me, after an extreme – they're interested.

I: So based on past experiences you've had with partnerships, what would an ideal partnership look like for you, for your next new partnership?

[00h24m30s]

M: I think a good partnership is one based on trust, based on sort of a long-term relationship, based on mutual … and probably iteration. In other words, constants iteration with that other group. So not just one-offs type of engagements, that's not a great way to build partnerships. A strong partnership is one in which you meet on a relatively regular time-scale, time period.

[00h25m33s]

Interviewee needed to leave.
[end of interview]

Ellen Brody interview

I = interviewer (Jerry Guo)
F = interviewee (Ellen Brody)

I: OK, go ahead.

F: So sanctuaries are a lot like national parks. We protect and manage areas in the oceans and Great Lakes. So we have one … sanctuary in the Great Lakes, and that is in Lake Huron, about … And they do so many partnerships. So I'll just give some examples of what Thunder Bay does. So it's … the rest of NOAA in that it's a place. So I understand that some of the … may not be applicable to some of the functions that NOAA has, but they're really amazing at seeking out partnership opportunities.

I: Right. So you mean the way they function in terms of partnerships may not be the way that other areas of NOAA function.

F: Yeah, so GLERL is a research lab, so you'll see as I talk about some of the opportunities. It's a little different when you have a place and you're working with a community. But still, I think some of the examples, you know, with the ideas of who we're partnering with, can have adaptation. It's just different because it is a place, and not the entire Great Lakes. So do you want me to start just telling you about some partnerships?

I: Yeah, I think that'll be great. Just kind of some partnerships you think are interesting.

F: Yeah, OK. Project Shiphunt is a really cool partnership and you're welcome to have that DVD. So this was with Sony and Intel, and I think they maybe committed a million dollars for this – well maybe not that much. A lot of money to support this. The storyline is can five high school students from Saginaw, Michigan find a shipwreck? So it's very interdisciplinary. Can five high school students find a shipwreck using a Sony VAIO laptop? So using data and technology, be able to locate a shipwreck. So they did locate a shipwreck, it wasn't the one they were looking for. But they were working with data from old weather data, looking at …metry, all sorts of historical records to go pinpoint where the research vessel should look for a shipwreck. So they find the vessel time … and we had to cover up the … because it wasn't Sony. They ended up with this DVD and it's promoting Sony and the power of a laptop to do something as cool as finding a shipwreck. And it was amazing for us that we were able to get … and … images … sensing for such a big sanctuary. So it helped us get data. We got some amazing product in terms of a story, a DVD about these top high school students and Sony got great PR from this.

I: So, it's kind of a partnership where every partner benefits in some way. Sony can get more exposure and more PR, and NOAA can get more data for shipwrecks and associated things.

F: Yeah, yeah. And now we have a product that we show in our theater and that we can show – I mean, this is what happens in natural sanctuaries, this is where you can learn about shipwrecks, this is … So we didn't have to spend any money except a lot of our staff time, it wasn't a very labor intensive project. It's really cool, you should watch it if you have time.

I: Right.

[00h04m57s]

F: So another example of – so one element is a – they make clothing for outdoor clothing and they dive – clothes you wear when you go diving. And the companies is called … So they funded, actually, they did the work. They created 3D tours of shipwrecks Thunder Bay. We gave them photographs of the shipwrecks and they had the technology – But this was cool because, one of the challenges with shipwrecks is people don't dive, they don't experience them directly. So anyway that we have, where we can give that kind of shipwreck experience, where you can see a shipwreck without having to be there is important. This is also really helpful for divers so they can know what they're getting into. So this was very cool, and it's helpful for – this was a company – to promote its work.

I: So for NOAA, from NOAA's perspective, the benefits of this is mainly for future shipwreck navigation or is it for more educational, general public?

F: This is more educational and for appreciating – for divers who are going onto the wrecks and for research … to make it safer for them and so they know what the wreck looks like when they get down there. It's just easier to know, to plan your dive and to know what you're getting into. And probably moreso just for education and … purposes.

I: Yeah, it's a really interesting way of applying photographs to kind of model, to put you in that environment so that you're more ready for when you actually do go to the shipwreck.

F: Let's see. We've also had a number of documentaries filmed at the sanctuary, History Channel, National Geographic. These places are – these companies are looking for subject matter, they're looking for a place. So again, it's great for us because we get a product, we can tell the world about our marine sanctuary, we provide boat time to them, or they pay us for boat time … we put staff time into it, but we're not paying them to produce a documentary about Thunder Bay.

I: But by them producing the documentary, they're allowing that knowledge to be put into a visual form for the general public to absorb.

F: Yeah, yeah. The … on the History Channel keeps showing these things. So a couple of years ago, Glass Bottom Boat company came to Alpena, and this is a cool partnership because they dock outside our visitor center, and we sell tickets in our visitor center. And we get a cut of the ticket price to support our programs. But we also send volunteers or staff on every one of the Glass Bottom Boat tours. So they're providing interpretation of the shipwrecks, talking about good stewardship, good ethics, so the passengers are really getting a good message, and it's a message that we control. So that's been very successful and it's brought a lot of people to Alpena for the Glass Bottom Boat.

I: I also wanted to ask you, when you were in the process of seeing whether or not these partnerships would be viable or not, what was your thought process behind deciding to actually go through with these partnerships?

[00h11m19s]

F: Well, for better or worse, we usually don't say no. For opportunities like Project Shiphunt, that was something – that did consume a lot of our staff time. It took a lot out of our staff, but it was just an amazing opportunity. We're probably better than most programs at saying "Let's go for

it." Rather than saying, "Well, what could go wrong? What's this going to mean for our current operations?" Very willing to take some risks and pursue opportunities and take advantage of – I mean, the Sony thing, they were looking at a place in the Mediterranean, they were looking around the world; they weren't just looking at the Great Lakes. So it was like, "Yeah, we can't pass this up." So sometimes I think that people can get concerned about taking on a project and what it might need. And we usually just go for it. It usually works out. There really needs to be a … and openness to a new way of doing business and thinking about the benefits. Potential benefits.

I: So for new and novel ideas, NOAA has a tendency to want to try them out?

F: Well, obviously our program, the sanctuary is very – our director has always been very encouraging of us and the individual sanctuaries to pursue partnership opportunities. In fact, this is our magazine that we put out every so often on coalition building. So that's partnerships. Something new that we are … you're welcome to have that. We do … with universities, where they may do research in the sanctuary. Or they demonstrate technology. We had, for example, working with Texas A&M, that has autonomous underwater vehicle, and looking for a place to demonstrate. So they come to Thunder Bay and demonstrate it. They get to test their equipment, we get the benefits of what the AUV can record and can find.

I: So would you say that in this partnership, both Texas A&M and NOAA, the marine sanctuary, have a mutual goal?

F: Yeah. I mean, we're getting data. They're getting to test their AUV, test their equipment to make sure it works and do any design modifications. And often times, being a sanctuary, they're special places, and we've found that applying for grants, we have a number of partnerships with cities, and non-profits applying for grants, it often helps to have a place like a national sanctuary because people recognize it and there are advantages to promoting a place. We have a partnership with Alpena Community College on the Marine Technology Program, where the community college developed this marine technology training program. We help support it in terms of helping teach it – coming to classes and doing some guest lectures. They're able to

use our research vessel. So they're training students, we're training students to have careers in … technology.

I: I think all these partnership examples are good examples of what your program is trying to achieve, in terms of what they can provide and what they are looking for. I also wanted to ask what you think the overall goal of the marine sanctuary program is in terms of establishing partnerships? So, why would they want to establish partnerships in the Great Lakes region?

[00h17m25s]

F: It helps us do our job better. It gives us more visibility, to promote what we do. Yeah, I think that's kind of it. It varies, simplistically.

I: Yeah, there are a lot of layers of depths that go into how you accomplish those goals. What would you say, from the partnerships you've been involved with or that you know about, what would you say are some important things that contributed to their success?

F: A lot of hard work, commitment to carrying through, keeping an open mind that things may evolve in a direction that you didn't foresee. … always know what you're getting into, but when you enter into a partnership, there might be a vague idea, so really understanding where you're heading with that and sometimes it may not end up exactly where you thought it was and having to adapt to that. And when it's not working, knowing when to pull back.

I: Are there specific examples of having to adapt to unforeseen circumstances that you want to share?

F: I haven't been involved directly with many of these, because we have a staff in Alpena. Not any that come to mind. I'll think about that. Just the idea that when you enter into a partnership, it may not end up exactly where you started. And to have a clear idea when you start if it benefits both partners.

[00h20m13s]

I: But along the way, things may change and your end result may end up really different from what you first anticipated?

F: Right. For example, on the Fourth Element thing, if it had turned out to be not a useful product, we wouldn't have it on our website. One of the uncertainties with some of these things – it's challenging, it did turn out fine, but if it hadn't, then it would be a conversation.

I: So drawing from your past experience, what would you say – how would you describe your ideal partnership?

F: Where both get something out of it. Both bring something to the table. The products can be used for as many purposes as possible. For some of the examples, we use some for research, we also use them for education and outreach, so we're really into multi-purposing.

I: So the last question I wanted to ask is what kind of future scenarios do you envision partnerships with the marine sanctuary will go into in the future?

F: Oh, you never know! Strategic partnerships, I have talked about opportunities – it is interesting to think about opportunistic partnerships and strategic partnerships.

I: Right. So opportunistic partnerships would be ones that come up suddenly –

F: … Sony calls with this idea and says what do you think? So we did not seek out Sony. The Glass Bottom Boat, to some extent, was opportunistic in that a company came and said, "hey, we're interested in having a glass bottom goat." I think we had been a little more strategic in our partnerships with universities and research. I haven't mentioned that we have programs … state of Michigan, with the city … apply for grants, we have a maritime heritage trail, signage, that has been something that we want done, so we partner with the city to apply for grants and … the city and sanctuary staff are working directly on this project with … That was very much a

strategic partnership. It's also interesting because we're in the process of designating a sanctuary in Wisconsin, in Lake Michigan waters. And part of the designation process – they have to nominate an area. We asked them for partnership opportunities. So they tell us what their partnership ideas are. And it often involves, like the Wisconsin Maritime Museum, some of the neighboring ideas to us. Partnerships are the name of the game. We do it well because of partnerships.

I: Would you say a lot of the marine sanctuary partnerships are non-traditional rather than traditional?

[00h25m29s]

F: I don't know. I think they're innovative. I think probably this Fourth Element thing – this clothing – doing the modeling is non-traditional.

I: Yeah, cause the project we're working on wants to look at more non-traditional versus traditional partnerships.

F: Yeah, yeah. Well, hopefully some of these ideas, some of my examples have given you ideas. Because I think they are not your standard things.

I: Right, you probably wouldn't think one like that.

F: Right. Take a look at some of the Pennsylvania nominations. Towards the end, they have some ideas for partnerships.

[00h30m01s]
[end of interview]

Jennifer Day interview

I = interviewer (Jerry Guo)
F = interviewee (Jennifer Day)

I: Well, Jennifer, thank you for speaking with me today. I wanted to talk to you about partnerships in NOAA, and NOAA has a history of partnerships with both traditional and non-traditional partnerships in an integral part of its history. I wanted to ask you for NOAA, what does the concept of partnership mean?

F: You know, I don't know. From my perspective, being in regional collaboration, if I have a clear sense of what is, which is why I think this project could be really important, to help clarify that for us, to help us with that. That'll be an important aspect to this work. I think that every part of NOAA is going to have a different perspective on this. I think you're going to get a very broad perspective on what partnerships mean, in that construct. The types of partnerships that I think I've been involved with so far in my time at NOAA have been more with our other partner organizations, whether they're with Sea Grant organizations that are, you know, organizations that are really more affiliated with the states. But again, those are more public in how they bring in their own partnerships in working with us. So it's almost like a derivative partnership, that we work together with Sea Grant in order to then take advantage of one of their partnerships, on the different things they do. So I think when we're working with the states or others, there's more of that kind of derivative partnership. It may not be a direct partnership of ours, but it may be with another government institution, either at the state or local level, in how they partner with private entities, and how we take advantage of that. So, but I am interested, I'm very interested in this topic about how we can do a better job with it, so I'm looking hopefully how I can be more informed on what is workable for us.

I: Thank you. So what do you think NOAA looks for differently in non-traditional vs traditional partnerships?

[00h03m14s]

F: Again, I don't know if there is a good definition of what makes a good traditional versus non-traditional partner, because I think the different parts of NOAA have gone in all sorts of different directions. With that, and I think maybe the difference might be how partnerships develop regionally, and what makes sense for that region. I think maybe another division of partnerships is either real large or small. So large would be, say, the partnerships we have with some of the big, like Google, or IBM, or where we have those large scale partnerships that are helping us with big data, things like that that are important to NOAA, as opposed to what may be a smaller, more targeted partnership for something that is very distinct for this region. Say, for example, the partnership that the marine sanctuary program put together with Intel. You know, that might seem like a big one, but it was very directed towards that one marine sanctuary, and looking for shipwrecks within that one marine sanctuary, and how we could leverage that partnership to help us with that. So it may be more instead of common or uncommon, big or small, there may be other ways we think about it. So I think how we divide that out or been those things will end up being different. Whether or not that may be something that is specific to the Great Lakes region, because we're on fresh water, as opposed to the coast that are salty water, or maybe even taking advantage of some partnerships that are successful in other parts of the country on a very regionalized scale, and how those can possibly even be adapted up here in the Great Lakes.

I: Great. So, I wanted to move onto the strengths of NOAA. So in a partnership, what do you think are the main benefits that on organizational partner gets from working with NOAA?

F: I think one of the main benefits is that NOAA, other than our saltwater fisheries area, is non-regulatory. So the fact that we have a very science-to-service type of – is our mission, is how do we do science, how does that then go back to serve the greater good through that service to stewardship of our natural resources. Because we have that service to stewardship end-of-the-line mission, I think that might make us more of an attractive target, because we're not controversial, we're not regulatory, we do things that serve the greater good where there may be organizations whether corporate or non-profit or others that may have a similar type of wanting to serve the greater community and wanting to partner with NOAA on helping that joint

common goal of servicing a community specifically. And whether that community has something to do with an economic interest, say, farming, or climate change and how we deal with education out to the farming community, or how – whatever that might be. Or within the weather – with hurricanes or tornadoes or educating on that, or one of our major missions is to … saving lives and property. There may be insurance companies out there that may want to partner with us more on what we're doing to save lives and property and in getting those messages out. Or even joint projects that could help us do a better job with that. On the coastal side or the Great Lakes side, right now, we may have issues that are starting to impact the fisheries on the Great Lakes. What other types of industry or economic interests at a local scale might want to partner with what's even going on in the Great Lakes fisheries. I think because we have that goal that I think other private interests might be interested in. There may be opportunities there for partnerships.

I: Well, thank you for that overview into what NOAA can provide to partner organizations. So I wanted to also ask, what benefits does NOAA expect from partnering with other organizations?

[00h08m40s]

F: I think being able to leverage … technology, resources. Like for example, this isn't what NOAA wants, but I'd love to see maybe how we can apply it here at NOAA. I went to a conference last fall, and I actually went to a seminar on public private partnerships and one of the government agencies that was speaking was the CDC, the Center for Disease Control. And they were talking about a very successful public private partnership that they were engaged with with Lysol. And they wanted to do more of an information campaign to get information out to communities – poorer communities, urban areas, about, like, I think washing hands. More effectively control disease and illness. And they ended up teaming up with Lysol because Lysol also has the same need from more of a … Lysol can help do all this stuff too, but then, CDC didn't really have resources. What they wanted to do was write a children's book that they could distribute into these neighborhoods, into these poor families and communities, to help them understand public health and the need for cleanliness or washing your hands or things like that. And so they ended up teaming up with Lysol. And so they kind of ended up working with Lysol

to write this book, and then Lysol paid for the publication of this book. And they were able to put their logo on it with the CDC logo, and get it out into these communities. So it helped provide some – I think, promotion for Lysol, but then it helped where CDC didn't have the money to publish a book and get it out, it gave them that benefit of getting the word out and Lysol also benefitted. So I think that was a joint benefit of being able to do that. So I think that was successful, and I'd love to see how we could grasp onto an issue that's important for NOAA. Or even NOAA here in the Great Lakes. Or broader. And is there a message we want to get out there and is there a private company like a Lysol or Johnson & Johnson or whatever that has the same need to get that information out, that would benefit both our missions.

I: So having a shared mutual goal is really important.

F: I think having that mutual goal is very important.

I: Cool. And this kind of goes along with the previous question, but what are the organizational traits NOAA looks for potential partner? For example, access to data, reputation.

F: I don't think we have one. I think that's one of the other brilliant things about the exercise that you're embarking on – is to help us understand that. What are – cause I think NOAA's vision is so broad, I think the opportunities for reaching out to the private sector to help us on any part of our mission is going to also be very broad. I think those are the kinds of information to be compiled. These are, from your team perspective, based on your own recommendations, based on your research, the things that will probably be the most valuable to us and help us understand that.

I: So, so kind of looking at what one organization can specialize in, and how that specialization can contribute to the well-being of society.

F: Yeah, yeah. Cause I think that's … we're NOAA. That's kind of our mission.

I: So based on previous partnerships that you have been involved in, how would you describe

your ideal partnerships tomorrow?

[00h12m55s]

F: You know, I don't even have a good idea for that either. I think that's what we're hoping to look for out of this project. It's because we don't have a lot of those answers, and I don't think we've been involved in a lot of partners in the Great Lakes, but it's something that we want to do. So this whole idea from a regional perspective is also new to us. And those are the kind of questions we're hoping to get answered through this.

I: Right. So now that you've told me a bit about NOAA's approach and views towards partnerships, do you see those approaches and views changing sometime in the future, or do you see them staying like, kind of like they are right now?

F: I think the one thing that's good about NOAA, because we're not regulatory, and we have a broad mission, and again, our mission is to, from a very service and stewardship kind of perspective, I think we're also open to changing that, depending on what is presented to us. Or what kind of comes along and we can say "You know, that is something unusual." I think the way we approach things is because even if it's something new and innovative, that's something we should really take a look at. So I don't see us staying static in anything we've been doing. I think we are always kind of looking for that new – what cutting edge, what can help us that we hadn't actually thought about. Or I think that's something that's kind of built into the DNA of our organization and something we'd be interested in.

I: So exploring new opportunities as they arise?

F: Yeah.

[00h14m44s]

I: So I wanted to also ask about some specifics of previous partnership experiences. In the

past, when you are searching for partnerships, how do you know when you've found the right one?

F: I think, again, all of it is opportunity driven. And I don't necessarily know only because I personally haven't been involved in a lot of partnerships, but I know a lot of the people that I've given to you on that list and others have been. What they necessarily look for, I think again it's not us necessarily looking for something but what opportunities present themselves. Like, I don't think a lot of people would have necessarily put the marine sanctuary together with Intel. But, what a great partnership that ended up being with Intel wanting to do something that involved high school kids, getting laptops with Intel technology into their hands, and what can they do with that? And then getting these kids out into a research vessel in the marine sanctuary out looking for shipwrecks? Who would have really thought about putting that together? But the opportunity presented itself and it turned out to be a really wonderful opportunity that gave not only promotion to what we're trying to do in the marine sanctuaries, especially protecting maritime archaeology, but also to Intel about working with kids and getting them involved with the different types of opportunities that could come from utilizing laptops, especially from a poor neighborhood where they may not even have a lot of that technological experience. So … and I think it also opened the door to them of what actually could be possible, where they may have, especially in a poor neighborhood where you may have limited access to technology or ideas of what you could be. It gave these kids from a inter-city, poor area the ability to really think, "Wow, I could do science. I could go to college for science. This is how cool science can be." And then utilizing our ships and our marine sanctuary to give them that experience. And I think that's another way. Where can we use our infrastructure to also meet the good of society through what these corporations? There is a woman that I have met several years ago. And she's actually developed her entire – she's in public relations, and she developed her own firm in public relations, but all she specializes in is working with corporations or companies – you know, private entities, in helping them to reach out and do more good for society types of things. She matches up corporations with non-profits. She matches up companies with charities. She matches up companies with other types of activities so that they can actually do that type of public private partnership that allows them to utilize their corporate – you know, because a lot of corporations do have that good for society kind of angle that – and they just need to find that

right partner. And so she – that's her sole business is working with corporations and matching them up with the right partner. To do not only just charity work, but how can they get out there and do something that's good for the community and use their resources to help for the good of the community. So I think there's a lot of, even in that model, you know, how do you reach out. And that's another thing that at the seminar I went to last fall, because a lot of this idea of public private partnership from my perspective is new to me and you know, one of the things they stress is a lot of times it is kind of the PR aspect of corporations that's interested in figuring out ways to have these public private partnerships that do something in a joint mission for the good of the community. That reaching out to the PR firms that may represent them, or even their own PR staff, of figuring out, you know, of where there could be a good partnership here that could serve the need of a private organization for wanting to reach out into a community and what, you know, NOAA could be doing to be a good fit. So that's another angle of how to reach out to, you know, a lot of private, you know, organizations. Is that mission of theirs also be to contribute to a community?

[00h19m30s]

I: Thank you. So, partnerships like the marine sanctuary and Intel have obviously been an overall success. What lessons from these successful partnerships do you think could be applied towards future partnerships?

F: I think the – what both organizations get out of it. That need, that common goal, and then what they both end up getting out of it that really serves their own missions. I think both have to really be involved in that. So I think that's probably the biggest lesson we learned. To make sure that you're matching up with those common needs, common missions. And I think that could be a little – maybe esoteric because you know, Intel had a need for wanting to reach out to students and encourage science and technology of students. And what we got out of it was wanting to reach out – what's happening in the Great Lakes – you know, shipwrecks, marine archaeology, getting these kids out to actually find a shipwreck. And they actually – they had done research in that specific case to figure out – I guess they were actually trying to research one specific shipwreck that they knew had occurred, but had never found the wreck itself. And

the kids that started out researching that – where it might have gone down, trying to hone in – you know, kind of that literature review versus then going out onto the water and what kind of technology they need to actually kind of try to find this wreck. And what actually ended up happening is that they never found that wreck. They found a different wreck that we hadn't even … on there, but they found a wreck. And it wasn't even the wreck that they were originally trying to find. So then also helped us because we located a new wreck in the marine sanctuary. I'm trying to think. One, Gary Garnet, who is on the list, he's the head of the weather service office in Cleveland. They had ended up partnering with the National Estuary and Research Reserve in the state of Ohio to develop weather-related education stuff. Just exhibits in their public visitor center that serves every time we have visitors up in that area. They can go to, you know, this visitors center. And they actually have provided a lot of the educational, interactive weather-type things that teach the public about, say, when it rains. How – what's the rain cycle look like when it falls on the ground and maybe picks up fertilizer and how when it gets into the water and how it creates pollution. And so in the whole cycle of that and in educating people on some of those kinds of aspects. Is there, you know, another group that is interested in helping us, you know, create joint exhibits that help teach the public about the water cycle and pollution and how all that, you know, goes together. I think there's a lot of interesting opportunities for us, for those kinds of things.

I: Right. So obviously we want our partnerships to be a success, but for those partners that don't necessarily go the way you want them to, what factors can you attribute that to?

[00h23m10s]

F: I have no idea. That's a good research question, though. There might be others, in other parts of NOAA that may have more experience with that. I don't.

I: OK. So you're lucky enough to not have any real negative experiences in partnerships.

F: Right. But I think the most important part in that question is not only what are the attributes of the not-successful partnership, but then – and I think again, that's all the kinds of information

that we're hoping to gain from this project so we can make better decisions going into the future.

I: So, that's all the questions I have regarding partnerships. Do you have anything you wish to add that I hadn't already asked about?

F: No, I am very excited about this project, though. And a lot of the questions that you have are questions that I think I also have. And NOAA has a need for. So how we reach out, and I'm interested in not only NOAA's perspective on a lot of those questions, but also on any kind of private enterprise's answers to those questions, and how they may seem, especially teaming up with a government agency, that again, where we have – a good thing is we are not regulatory – that we are science to service to stewardship type of mission. Which is good for society and good for our areas.

I: Cool. Well, thank you, Jennifer.

F: Yeah, you're welcome.

[00h24m47s]
[end of interview]

Appendix B: Additional Case Studies

Coastal Management

Lake County Soil & Water Conservation District, University of Minnesota Extension, Minnesota Lake Superior Coastal

Program, and the City of Two Harbors, Minnesota

The City of Two Harbors, Minnesota is located along the shore of Lake Superior approximately 25 miles north of Duluth. Although the city's population is under 3,700 people, significant amounts of logging, railroad development, and urbanization upstream have altered the hydrology within the Skunk Creek watershed. In July 1999, Two Harbors experienced a 100-year storm event that extensively damaged private property, city infrastructure, and streets and highways. In addition, streambank erosion and pollutants from runoff threatened the quality of the water being supplied to residents' homes. With increasing storm-induced streamflows in the years since, additional water treatment has been required. Both the real impacts and potential threats prompted support for immediate action in stormwater management.

In an effort to prevent damage of a similar magnitude to 1999's event from occurring again, Lake County Soil & Water Conservation District (SWCD) staff and University of Minnesota Extension personnel began assembling a team to create a stormwater management plan for the City of Two Harbors. With the help of a grant from the Minnesota Lake Superior Coastal Program, the plan was completed about two years after the flood. Throughout the next ten years, the city invested over $80,000 into its stormwater infrastructure. Along with other matching competitive grants, the following projects were completed: three flood control basins, two stream bank stabilization projects, and a rain garden. In addition, a Two Harbors Urban Forest Management Plan was also developed, with an emphasis on stormwater management.

This newly reinforced stormwater system helped mitigate damage from the June 2012 "Solstice Flood". This flood resulted in eight to ten inches of rain onto the saturated soils of northeastern Minnesota. Nearly all of this rainfall immediately ran as surface runoff down the moderate to steep hillsides, washing out roads and bridges, uprooting trees, dislodging boulders, and carrying massive quantities of debris and sediment directly into Lake Superior. Effective stormwater system design helped Two Harbors sustain only minor damage to public infrastructure and private property.

Using Beach Safety Kits to Prevent Drowning

In summer 2012, a young teenager was pulled away from the Lake Michigan shore by a rip current and subsequently drowned in Port Washington, Wisconsin. A popular assumption is that dangerous currents and waves are in anomaly in the Great Lakes region. However, dangerous currents are a regularly occurring and predictable threat to Great Lakes swimmers. Since basin-wide monitoring began in 2002, more than 307 people have been rescued and 144 have drowned as a result of dangerous currents.

Since 2010, the number of deaths resulting from dangerous currents have continued to rise, despite technological advances that have made dangerous current detection and reporting more reliable throughout the Great Lakes region. In an effort to reduce fatalities and incidents from dangerous currents, the Dangerous Currents Outreach and Beach Safety initiative has been implemented by local, municipal and state organizations.

In Port Washington, outreach specialists distributed materials including publications, signs and equipment. Life rings and life jackets have been placed on the beach to help prevent fatalities. A regional water safety collaborate effort including outreach experts from Illinois-Indiana, Michigan, Minnesota, Ohio and Wisconsin Sea Grant programs are working with state Coastal Zone Management and NOAA's Coastal Storms program to develop specific messaging, factsheets, and videos targeted toward increasing the public's understanding of what dangerous currents are, as well as how to identify and escape them. Also, this collaboration has selected beaches along Great Lakes' coast to install emergency rescue equipment that can be used to save individuals from dangerous currents.

Education

NOAA Office of National Marine Sanctuaries (ONMS) and the Oakland Museum of California

Background:

A partnership that began in 2005 with an informal conversation broadens NOAA reach to diverse populations. The Oakland Museum of California (OMCA) brings together collections of art, history and natural science under one roof to tell stories of California and its people. Opened in 1969, OMCA is a leading cultural institution of the Bay Area and a resource for the research and understanding of California's dynamic cultural and environmental heritage. The museum is a community resource for Oakland and East Bay residents, offering community events, lectures, docent program, school programs, teacher workshops, and off site explorations in California. OMCA serves primarily East Bay families (80% of total visitorship), paid admission, museum members, and school groups. This museum is becoming more of a tourist destination. The annual visitation in 2012 was 150 thousand with a goal to increase it to 250 thousand.

● The breakdown of ethnic diversity in the Oakland area is White (31%), Black/African American (36%), Asian (15%), Hispanic/Latino (22%), and American Indian, Native Hawaiian/Pacific Islander and other races (14%) according to the 2000 Census.

● About 40% of participating students are from the Oakland Unified School District (OUSD), which includes a diverse student population of over 54 thousand children. The ethnic breakdown for OUSD is 47% African American, 29% Latino, 18% Asian/Pacific Islander, 6% Anglo/European American, and 1% American Indian/Alaskan Native. Nearly 55% of these children come from low-income families and qualify for free or reduced price lunches. More than 35% are recent immigrants who speak English as a second language.

The partnership with OMCA evolved from a conversation in 2005 with an interpretation specialist, who mentioned that a major renovation was planned in the near future and OMCA sought to include more ocean content. This became part of the 5-year exhibit plan, which was adopted by the museum’s site management. A proposal of 500 thousand dollars was submitted to NOAA Office of National Marine Sanctuaries (ONMS) for Procurement and Construction Funds (PAC). Funds were transferred through a Broad Area Announcement Grant. In 2007, ONMS awarded funds to the OMCA to build exhibits that focus on Cordell Bank in the OCMA Natural Sciences Gallery.

Through that grant, Jenny Stock of NOAA Cordell Bank National Marine Sanctuary (CBNMS)

collaborated with OMCA to produce a new permanent exhibit gallery about CBNMS, other California sanctuaries, and ocean science and conservation. The goals for the exhibits were to:

1. improve public understanding of the importance of California's marine and coastal resources;

2. increase awareness of environmental issues along our coastline and stewardship opportunities;

3. provide a venue for students and public to access current marine research outcomes; and

4. implement innovative interpretive approaches to presenting current marine science related research and how to become active stewards.

Results

NOAA has contributed 500 thousand dollars of funding and 25 to 30 thousand dollars of staff time spent on the partnership, funding mechanism, and exhibit development. The return on this investment includes exhibit space, ongoing education programming, outreach and becoming a hub for learning about National Marine Sanctuaries in California. Most importantly, there is a place for people to learn about Cordell Bank, which is 20 miles offshore and inaccessible to most people. OCMA provides a built-in audience for NOAA to communicate with and influence.

● OCMA audiences - The partnership broadened the NOAA community by reaching a new population in the East Bay. The Natural Sciences Guild, a membership base at the museum that attend natural science lectures and field trips, is considering a multi-day field trip about Cordell Bank NMS in 2014.

● Cordell Bank Gallery - The Natural Sciences Gallery reopened in 2013 and includes seven places: Oakland, Mount Shasta, Tehachapi Mountains, Coachella Valley, Sutter Buttes, Yosemite, and Cordell Bank. The Cordell Bank gallery is a 3 thousand square foot gallery of exhibits showcasing the major marine habitats and communities located within the Cordell Bank NMS. It also includes exhibits on the iconic marine and coastal communities located within all four California National Marine Sanctuaries.

● Education and public programs - In 2012, OMCA initiated a school program focused on Cordell Bank that continues today (as of 2014). This program was funded on their own, without

additional funding from NOAA. Jenny Stock had a small role in consulting about the content of this program.

Current Status of the Partnership

This is a currently active partnership (as of 2013). Although all parties would like to continue to work together, this is a fragile time right now in the partnership. Now that the exhibits in the gallery are open and the original MOA has expired, the partners will determine how to work together through programs, community events, and more. There is potential for STEM collaborations, teacher professional development, student programs, after school programs, public programs and further community engagement. In addition, the continued partnership is an opportunity to address following activities:

● Plan ways to obtain the numbers, evaluation, and impact results. The new draft MOA includes such language. Funds were transferred through a Broad Area Announcement Grant, but a better arrangement would have been a cooperative agreement.

● Align the partnership with NOAA's current educational output measures, including formal education programs, informal education programs, and professional development programs.

Conclusion

The OMCA has established relationships that helped provide different levels of a) policy access to those networks for NOAA Education officials, b) science content knowledge, c) 28 access to new or refined approaches for audiences, constituents or stakeholders in addition to helping contribute to NOAA’s workforce development goals. The partnership is strongly supported by connections between people in both organizations committed to sustaining the partnership, although a lack of funding makes this a fragile time for the partnership.

NOAA and the American Meteorological Society (AMS)

Background

A partnership between NOAA and the American Meteorological Society (AMS) develops and implements courses for pre- and in-service K-12 teachers with strong content in atmospheric and ocean sciences. It has reached an estimated 140 thousand teachers and 4.9 million students directly or indirectly since the inception of the program in 1990.

The AMS is a non-profit professional and scientific organization representing those in atmospheric, oceanic, hydrologic, and related sciences. Like most professional organizations, AMS publishes peer-reviewed publications, holds various meetings and conferences for its members and other professionals involved in scientific research, forecasting and related work. AMS offers numerous educational programs for K-12 audiences, focusing primarily on in-service teachers, and postsecondary audiences. It creates introductory college-level weather, ocean, and climate courses offered by higher education institutions, with a special focus on smaller liberal arts colleges, community colleges, and minority-serving institutions. All educational initiatives include a component directed toward increasing participation of underrepresented minorities in science and science teaching.

The AMS Education Program was established in 1990. This same year marked the beginning of Project Atmosphere and the close working partnership between AMS and NOAA. With a NSF grant and the in-kind support of NOAA, a two-week summer precollege teacher workshop on weather topics was conducted at the NWS Training Center (NWSTC) in Kansas City. The NWSTC summer workshop had already been in existence since 1984, run by the State University of New York [SUNY] Brockport with NWS in-kind support. It became the first major initiative of Project Atmosphere. In 1994, again with primary support via grant from NSF and in-kind support from the U.S. Navy and NOAA, the Maury Project: Exploring the Physical Foundations of Oceanography Program was started at the U.S. Naval Academy. These two summer programs have been held annually since then and provided the initial training of master teachers who were instrumental in the implementation and continued offering of the AMS suite of DataStreme courses.

With the reduction over time of support from NSF, NOAA began providing direct funding in support of both summer training programs. This funding came from different line offices, beginning with annual ad hoc grants from NESDIS, NWS, NMFS, NOS, and OAR. In 2001, the

AMS/NOAA Cooperative Program for Earth System Education was proposed in order to draw together the various NOAA and AMS Education Program cooperative components. The working relationship between AMS and the NOAA Office of Education (OEd) was formalized with a Memorandum of Agreement (MOA) on 13 September 2004 and signed by John J. Kelly, Jr., Deputy Under Secretary, NOAA/DOC. The MOA states that

"... the Parties will support a cooperative program of projects and activities in ocean, coastal, atmospheric, hydrologic, and Earth system science education, aimed at preparing citizens in our society to understand and act on information related to our planet's dynamic air and water systems and how they affect every aspect of our lives." The MOA formalized the de facto working relationship that has existed between NOAA and AMS for many years.

The DataStreme programs have been developed and continue to be conducted with technical assistance and various kinds of support from all NOAA line offices and hundreds of NOAA personnel. The first DataStreme course, DataStreme Atmosphere, was implemented in 1996 via Local Implementation Team (LIT) leaders, who were trained at Project Atmosphere summer workshops. NOAA provided in-kind support for DataStreme Atmosphere, particularly in the annual summer training of LIT leaders. Each LIT is composed of at least one master precollege teacher and most include a professional meteorologist, hydrologist, oceanographer or environmental scientist. NWS field offices have hosted many of these meetings. In 2002, NOAA began providing direct financial support for this partnership via a grant. In 2004, the National Weather Service's National Center for Environmental Prediction became the primary provider of over 175 real-time meteorological products delivered via the course webpage, including customized maps, charts, imagery, and text.

This partnership has evolved from in-kind support of teacher professional development programs through the direct involvement of NOAA personnel and facilities to financial support in the form of grants and cooperative agreements. NOAA's early awards to AMS were non-competitive, but since 2005 OED has provided a competitive award vehicle for one-NOAA financial support. The DataStreme Ocean course started in 2005 with with a 3-year award from NOAA's Environmental Literacy Grant Program. Development and subsequent implementation of DataStreme Ocean and Atmosphere courses has been almost entirely supported by NOAA both through in-kind and annual financial support. In 2007 an institutional award to AMS was

established competitively and then renewed in 2012 for another five years. The evaluation criteria of the funding announcement that established the initial institutional award stressed the importance of the involvement of NOAA personnel and other NOAA assets as well as the use of partnerships to leverage NOAA's investment. Since 2007, six NOAA offices (NESDIS, NWS, NMFS, NOS, OAR and OED) have contributed equally to program support, with award administration through OED.

Results

Conservatively over 14 thousand educators, primarily in K-12, have completed the DataStreme Atmosphere and Ocean courses. Teachers have been asked to report on the number of other teachers they train on the course materials and the number of students reached by themselves or these secondary recipients. To date, an estimated 140 thousand teachers and 4.9 million students have benefited directly or indirectly from these courses.

Since 2002, NOAA has provided almost $7 million in direct financial support to AMS to support its K-12 teacher professional development and leadership training programs.

The in-kind contribution of 275 NOAA professionals involved in supporting DataStreme Atmosphere and DataStreme Ocean courses is estimated to range from 96 to 120 hours per year per person for an average of 5 years since 1996. The time estimate is based on the average volunteer time for one NOAA LIT member assuming a contribution of 4 to 5 hours per week in each 12-week semester. NOAA personnel have also provided time and expertise in the review of AMS's course materials, but this contribution has not been quantified. Nevertheless, assuming $150K for the annual cost per federal FTE (a standard estimate), NOAA's minimum in-kind contribution has been $9.52M – 11.90M since 1996.

The in-kind contribution is likely much greater because the estimate does not include the review of course materials and support provided at NOAA locations for LIT meetings, as well as the summer institutes that train the master educators who in turn become LIT members. Additionally, this figure does not include the in-kind cost of NCEP's production of real-time data visualizations and explanatory text.

A conservative per-teacher cost estimate ranges from $1,158 to $1,325. NOAA's real and in-kind investment has enabled the integration of NOAA data, data products, and educational

resources into these teachers' classrooms and beyond, thus introducing 4.9 million students in the US to NOAA-related sciences and NOAA products.

Further, NOAA's investment in these courses has been matched almost dollar-for-dollar by AMS. Through SUNY-Brockport, AMS has been able to offer tuition waivers for their course credits. This offer of three free course credits is a huge incentive for educators to complete the semester-long courses. AMS's cumulative in-kind contribution in tuition waivers for Datastreme Atmosphere and Ocean course participants is $20.2 million, with an an average participant cost of $1,373.

Lessons Learned

One of the reasons for AMS's continued success in sustaining this partnership over such a long time is their continual cultivation of supporters among NOAA leadership as well as those individuals providing in-kind support "on the ground." The deep and long-lasting connections with individuals at NOAA have enabled AMS to sustain some financial support even while overall funding has gone down. AMS continues to focus on long-term involvement of the teachers who have taken their courses and local implementation team members who have helped them implement their programs. Additionally, AMS has leveraged the funding provided by various federal agencies across its suite of programs that they offer in support of K-12 and higher education. This has been a strong selling point with NOAA leadership.

Current Status of the Partnership

AMS has been a driving force behind this partnership and AMS educational staff members have actively cultivated numerous connections throughout the agency. Consequently, the biggest challenge in recent years has been sustaining a budget from across all line offices during the strained financial situation facing the agency's budget, especially for its education programs. An additional challenge from OED's perspective has been managing the process for obtaining funds from across the line offices while continuing to encourage AMS to conduct a more robust evaluation of their courses' impacts despite recent budget cuts.

NOAA personnel and NOAA data products, educational resources and other assets will continue to be a key piece of the DataStreme courses. The question is whether AMS will be able to shift the burden of financial support to other sources outside of NOAA. The institutional

award established in 2007 was intended to show NOAA's long-term commitment to the program with the expectation that over time the dependence on NOAA funding to sustain the routine operations of the DataStreme courses would decline. AMS is currently developing revenue streams from the sale of their course materials, as textbooks and more recently e-books, from multiple programs to sustain these operations.

Conclusion

The NOAA partnership with the American Meteorological Society (AMS) meets the criteria of a high-return partnership, in that the benefits to NOAA and partners outweigh the investment and involvement for all parties involved. The partnership provides benefits national, regional, local initiatives as described in this case study. Partnership success has been contingent on connections among people in both agencies.

Restoration

Combating Invasive Species in the Les Cheneaux Watershed

In Mackinac County, Michigan, of Clark Township's more than 2000 residents, more than 40% make their living from outfitting, lodging, and hospitality services to the thousands of tourists who visit the islands annually for a variety of activities. Over the last few decades, there have been noticeable changes in the watershed, particularly declining water levels and the encroachment of invasive plant species. In the Les Cheneaux Watershed, levels have gotten so low that residential docks, harbors, and points of access have had to be extended or dredged order to keep them accessible during the summer. The introduction and propagation of invasive weeds in the has been much faster. By 2006, the aquatic invasive weed *Eurasian watermilfoil* had become very dense in some areas and resulted in fish populations noticeably declining and

boaters being unable to navigate without their propellers becoming entangled by the weed. Also, the community became faced with an invasion by *phragmites*.

The cumulative impacts of low lake levels, influx of invasive plant species, and predicted changes in climate could have significant implications for the quality and accessibility of the natural features that are the linchpin of the local economy. Since 2007, about $600,000 in community investments and grant funding has been spent on the management of invasive species in Les Cheneaux Watershed alone. Multiple management techniques have been applied to combat existing invasive species. Eurasian watermilfoil has been intensively managed through biological control methods. The community funded the purchase and planting of 15,000 naturally occurring weevils in two pilot locations. The project was largely successful, reducing EWM growth by 85% from 2007 to 2011. However, EWM returned in 2012 and grew in dense carpets just below the water's surface.

In recent years, the Great Lakes Restoration Initiative has been an important source of financial support for invasives management. NOAA has created a series of social science tools for coastal resource managers to help use public engagement to promote invasive species awareness.